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CARCINOGENESIS IN RELATION TO SKIN CANCER.[1]

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THE skin is a complex tissue, with its differentiating squamous epithelium at the surface and the various appendages projecting downwards into the corium. The latter, composed essentially of collagen and elastin fibres, provides anchorage, carries the blood-vessels and lymph-vessels, nerve endings, etc., and indirectly supplies the epithelial structures with their nutriment. The functions of the skin are even more diverse—to protect the internal tissues of the body, to maintain sensory contact between the body and the surroundings, to control body temperature, to serve as an excretory and secretory organ, and to provide hair coverage. An important feature of skin is its superficial location, which permits continuous observation of the changes occurring in it. This has been particularly helpful in the study of the early phases of carcinogenesis, and perhaps explains why we know more about skin carcinogenesis than about that of any other organ.

So complex a tissue might be expected to yield a great variety of tumours. I do not propose, however, to discuss the diversity of tumour types arising in the skin, but intend, on the contrary, to analyse some of the unifying principles of carcinogenesis as manifested in so easily observable a tissue. I shall, in fact, have little to say about skin tumours as such, but will concentrate on the preneoplastic processes—that is, on the changes before the neoplasm becomes clinically demonstrable or histologically characterized.

The first problem to be faced in this discussion is, what constitutes "preneoplasia" in skin carcinogenesis?

The term "preneoplasia" implies that we really know when "neoplasia" begins. This is actually not at all simple. Skin carcinogenesis is a very slow process, lasting from two to 40 years in man, or from about six weeks to 18 months or more in the mouse. The eventual neoplasm, as recognized clinically or histologically, is, therefore, the end result of a very prolonged action.

But are we justified in judging established neoplasia merely on the basis of visual manifestations? The answer is, I suppose, that we cannot help ourselves, and must accept such visual criteria with the mental reservation that the true beginning must be earlier than the time when the tumour becomes apparent. But how much earlier?

When the growth curve of a very small neoplastic lesion in the skin is extrapolated to its theoretical zero point (see Figure I), it seems evident that the true beginning still comes very late in the carcinogenic process. From this, we can deduce that a "preneoplastic" stage does

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exist, and that it can be defined as "the period prior to the theoretical, morphological zero point".

A distinction must also be made between "preneoplastic" and "precancerous". The term "precancerous", so important to the clinician, refers to the stage before the onset of malignancy. But not all tumours are malignant; and when malignancy supervenes in a benign neoplasm, the distinction between "preneoplastic" and "precancerous" becomes particularly significant. In fact, the majority of squamous carcinomas of the skin do pass through a transition stage of benign papilloma. Admittedly, this does not occur in the case of rodent ulcer, which is locally malignant from the start. Even squamous carcinomas of the skin appear sometimes to be malignant from the start; while, on the other hand, some papillomas remain indefinitely benign. But the fact that the majority of skin carcinomas do develop from papillomas, and that the latter usually continue to grow without additional stimulation, makes it evident that this type of benign papilloma is a true neoplasm, and consequently, that "preneoplasia" of the skin refers to the pre-papilloma stage.

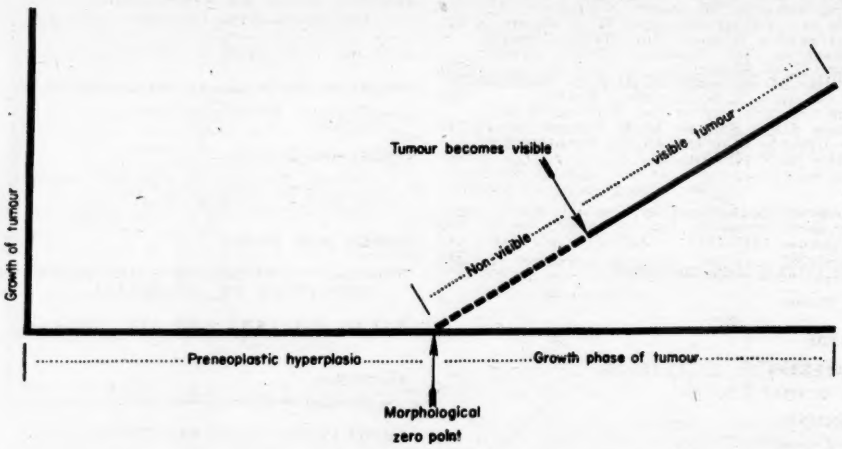

FIGURE I.
Schematic representation of tumour growth (extrapolation to morphological zero point).

Now that we have characterized preneoplasia as a process distinct from the growing phase of an established tumour, the next question is, what part does it play in the over-all process of tumour genesis?

In general terms, preneoplasia represents the critical period during which the transition from normality to neoplasia takes place. But here, morphology cannot help us, for preneoplasia is, by definition, concerned with the changes that precede the visible tumour. Indeed, it is fair to say that excessive preoccupation with morphological considerations was largely responsible for the fact that the latent period remained for so long a mystery. It was only when biological methods of analysis were introduced that the phenomenon began to acquire some meaning.

Let us, then, forget for the time being the dermatological "precanceroses"—lesions in which carcinogenesis occurs more readily than in normal skin, but which may themselves have nothing to do with the carcinogenic process; also the histological concept of "carcinoma-in-situ", which merely represents the recognition of pre-invasive malignancy. Let us, in fact, depart from the clinical and histological methods of approach, and look at the problem more in functional terms.

We should remember, in this connexion, that the chemist does not actually see atoms or molecules as such, nor does the physicist see electrons or neutrons. Yet the existence of these entities, their properties and ractions, can be investigated with extraordinary precision. The biologist must also accept the principle that visual perception is not the sole means of establishing scientific truths, and must face the fact that the microscope is not the only implement, or necessarily the most suitable one, for the solution of all his problems.

The analysis of sub-visual processes, in the field of the natural sciences, is accompiished by specially devised experimental systems. The same has been attempted for the study of the preneoplastic phase of carcinogenesis. I should like to bring before you some of the results obtained by this method, and to discuss their implications in relation to the general problem of tumour pathogenesis.

One of the deductions carried over from earlier morphological studies was that "a tumour never arises in a healthy tissue", which carried with it the implication that "irritation is the underlying cause of cancer" or, in pathological terms, that "hyperplasia is an essential precursor of neoplasia". How valid are these deductions, and what do they, in fact, denote?

It is true that in tissues that can be closely observed (for example, in skin), the appearance of a tumour is commonly preceded by prolonged hyperplastic changes. But it is equally true that the opposite situation—a state of atrophy of the skin—is also often observed as an apparent forerunner of a tumour. The problem can be presented in a twofold fashion: whether hyperplasia is a constant precursor of neoplasia; and if so, whether it plays an essential role in carcinogenesis, or merely occurs as a concomitant, arising from the fact that carcinogenic agents happen also to be "irritants" in a non-specific sense.

One way of investigating this problem was by comparing a wide range of carcinogenic agents both for their relative potencies of carcinogenic action and for their (short-term) hyperplasia-inducing capacities, in order to determine whether the two ran parallel. It has indeed been claimed, by Pullinger (1941) and others, that such a correlation does, in fact, exist.

There are, however, some inherent weaknesses in this kind of approach. In the first place, since most of the available skin carcinogens belong to the same class of compounds—the polycyclic aromatic hydrocarbons—any observed correlation would be limited and, therefore, deceptive. It might well be that for other, as yet unknown, categories, the correlation would not hold. Furthermore, a correlation never constitutes proof of a true association. Another way of examining the problem was by inten-

tionally substituting non-specific hyperplasia at the start of the carcinogenic experiment, and observing whether the eventual tumour development was thereby speeded up. I had, by chance, the opportunity of testing this about 20 years ago, while investigating the mode of action of croton oil (Berenblum, 1941*a*).

The scheme of the experiment is illustrated in Figure II, where the tumour incidence due to the carcinogen alone is shown by the continuous curve, while the anticipated incidence resulting from the addition of prolonged, non-specific hyperplasia prior to the carcinogenic action, is shown by the interrupted curve. When croton oil—a powerful hyperplasia-inducing agent for skin—was applied for 26 weeks before the commencement of carcinogenic

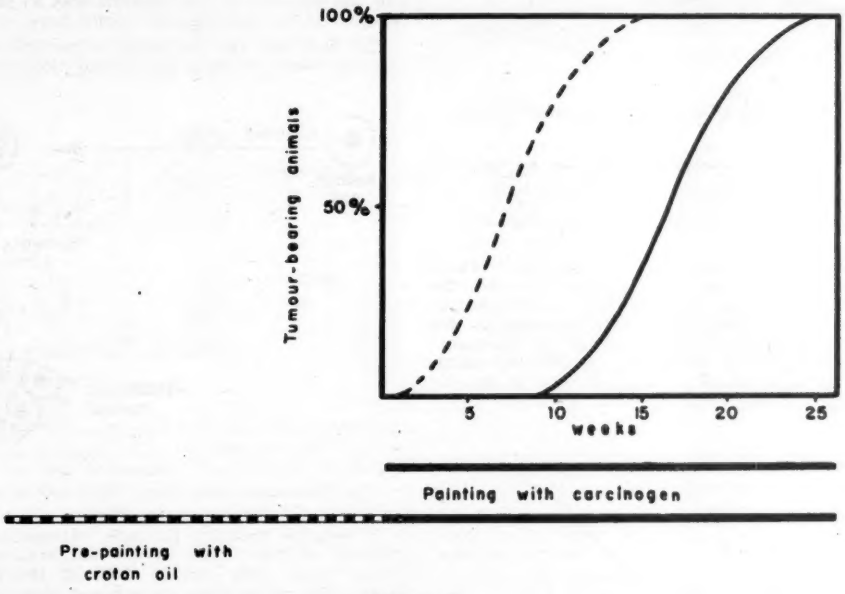

FIGURE II.

treatment, the tumour incidence curve, in fact, remained unchanged, in spite of the preceding non-specific hyperplasia. The anticipated moving forward of the curve did not, in fact, take place.

This somewhat surprising result could be interpreted in one of three ways (see Figure III): (i) that "pre-neoplastic hyperplasia" is very specific in nature, despite its close histological resemblance to the hyperplasia induced by non-carcinogenic irritants; (ii) that hyperplasia is a side issue, unconnected with the carcinogenic process itself; or (iii) that the first effect of carcinogenic action is a truly specific change, not necessarily connected with hyperplasia, but that subsequent to this, hyperplasia is essential for the realization of the tumour. Which of these three interpretations is the correct one will be more easy to judge after we have considered some of the other experimental evidence bearing on the problem.

In describing the foregoing experiment, I mentioned that it was a chance observation, made while studying the mode of action of croton oil on the skin of mice. This arose from earlier experiments, designed to test the effect of supposedly non-carcinogenic irritants added to a known carcinogenic agent, the two being applied concurrently (once or twice a week) to the skin of a large group of mice, and the results (average latent period for the group) compared with that of the carcinogen alone. By this means, it was possible to observe any "anti-carcinogenic" or "cocarcinogenic" effects produced by the adjuvants (Figure IV).

In 1929, I came across the first example of an anti-carcinogenic effect, while testing mustard gas, in low concentrations, together with tar, on the skin of mice. The carcinogenic action of the tar was thereby almost completely inhibited (Berenblum, 1929). Subsequently, while searching for other anticarcinogenic agents, I observed a striking example of the opposite effect—of cocarcinogenic action—by adding croton oil to a dilute solution of 3:4-benzpyrene and applying the mixture repeatedly to the skin of mice (Berenblum, 1941*b*).

For more precise information about the mechanism of cocarcinogenic action, the croton oil and the carcinogen were next applied during separate periods to the same area of skin—that is, the croton oil was applied prior to the commencement of carcinogenic action in one experiment, and after completion of a short period of carcinogenic action in another experiment. As has already been mentioned, pre-treatment with croton oil was without effect. Post-treatment with croton oil, on the other hand, caused a dramatic increase in tumour incidence (Berenblum, 1941*a*). Indeed, Mottram (1944) subsequently showed that if the carcinogen was applied once only before the croton-oil treatment, instead of eight times as in our original experiment, the effect was even more clear-cut, with no tumours in the case of the carcinogen alone, and many tumours in the case of the single carcinogen treatment followed by croton-oil applications.

Croton oil was, in fact, found to have some carcinogenic action of its own, the tumours tending to appear rather late. However, on theoretical grounds, the results obtained by the double action could not be accounted for by simple summation; experimentally, this possibility was excluded beyond any doubt by testing the two actions in reverse under otherwise identical conditions, and obtaining tumours only when the croton oil followed the single carcinogen treatment (Berenblum and Haran, 1955).

In short, croton oil could complete, but could not effectively initiate, the entire carcinogenic process. From this, it was concluded that the beginning of carcinogenesis and the later stages of carcinogenesis entailed different mechanisms.

A similar "two-stage" mechanism of skin carcinogenesis was independently reached shortly before our results were

published, by a somewhat different process of reasoning. While studying the cause of regressions of tar-induced papillomas in the rabbit, Rous and his co-workers (Mackenzie and Rous, 1941; Friedewald and Rous, 1944) showed that many of these tumours, which had apparently completely disappeared, could be made to reappear at the identical sites, not only by renewed tarring, but even by a variety of non-specific forms of stimulation. By thus demonstrating that tumour cells could remain in a latent

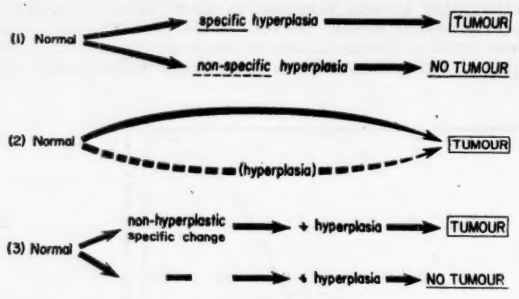

FIGURE III.
Three possible functions of hyperplasia in carcinogenesis.

or inactive state and be awakened by treatment which was itself incapabale of inducing tumours, they laid the foundation of the "two-stage" hypothesis of carcinogenesis, which postulates an "initiating" phase, responsible for the conversion of normal cells into "latent" or "dormant" tumour cells, followed by a "promoting" phase, responsible for the encouragement of these changed cells to develop into visible tumours (see Figure V).

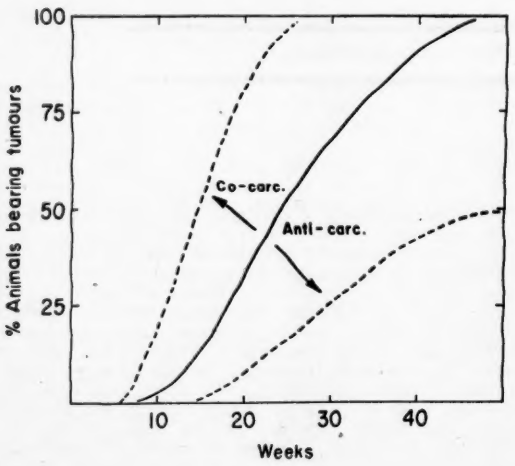

FIGURE IV.

Shubik and I (Berenblum and Shubik, 1947 *a* and *b*; 1949), using again the croton-oil technique in mice, were able to characterize some of the properties of these two components of carcinogenesis. Initiation was apparently very rapid in action, possibly even instantaneous, and irreversible—the latter, demonstrated by the fact that the number of tumours eventually produced by the double action remained the same whether the croton-oil treatment was started immediately after the initiating stimulus, or was delayed for at least 43 weeks. Promotion, on the other hand, was shown to be a very slow process—presumably responsible for the greater part of the latent period of carcinogenesis. In quantitative terms, the number of tumours arising out of the double action was dependent on the concentration of the initiating stimulus, while their speed of appearance was dependent on the promoting stimulus.

It seemed plausible, at first, to suppose that promoting action operated by stimulating cell division—that is, by virtue of the hyperplasia it induced. As has already been mentioned, croton oil is a very effective hyperplasia-inducing agent for the mouse's skin. However, when several other hyperplasia-inducing agents were tested for promoting action (that is, after a preliminary initiating stimulus) and found to be ineffective (Shubik, 1950), an alternative explanation had to be sought.

The answer came, interestingly enough, from a theoretical analysis of what pure hyperplasia could potentially achieve under such conditions (Berenblum, 1954); and the outcome of the analysis was so far-reaching that it deserves to be restated briefly here.

The fact that the thickness of normal skin epithelium remains fairly constant throughout life denotes that there

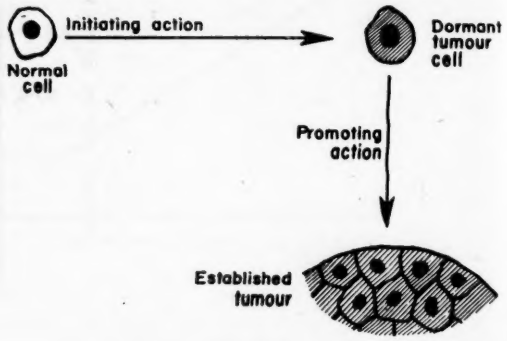

FIGURE V.
The "two-stage mechanism" hypothesis of carcinogenesis.

is a balance between the rate of cell division and the rate of cell death. This means that, statistically speaking, when "stem cells" divide, 50% of the progeny remain stem cells, while 50% mature and die (see Figure VI). So long as such an equilibrium exists, progressive growth, as occurs in neoplasia, is impossible. Conversely, one may say that neoplasia is essentially a condition in which the growth equilibrium principle does not operate.

In the case of hyperplasia, there is still an equilibrium, though set at another level. This means that when the rate of cell division is artificially raised, there is, after a short period, a commensurate increase in death rate.

The question then arises, what is the mechanism of the disequilibrium in neoplasia or, for that matter, during the promoting phase of preneoplasia? The most plausible mechanism would be a delay in maturation at the stem-cell stage, so that the two daughter cells, arising out of the division of a stem cell, remain uncommitted at the time of the next division—uncommitted as to whether their fate is to be a stem cell or a maturing cell (Setälä and Ekwall, 1950).

We now see why hyperplasia alone could not serve as the promoting stimulus in the two-stage experiment, unless it was accompanied by some other process—presumably, delayed maturation at the stem-cell stage. One cannot say with certainty that hyperplasia plays no part at all in promoting action, since croton oil, or the surface-acting agents studied by Setälä (Setälä and Ekwall, 1950), or other promoting agents so far studied, are all hyperplasia-producing substances. It may well be that hyperplasia is a necessary requirement for promotion, though not the critical factor.

With regard to initiating action, the situation is more clear-cut. The initiating agents originally used—for example, 3:4-benzpyrene, 9:10-dimethyl-1:2-benzanthracene,

and other polycyclic aromatic hydrocarbons—were all powerful hyperplasia-inducing agents. Since then, however, a very effective initiator for skin carcinogenesis has been discovered by Salaman and Roe (1953)—namely, urethane—which produces no epithelial hyperplasia or any other demonstrable change in the skin, even when applied for long periods. Neither is urethane carcinogenic for the skin when acting alone. Yet, when it is applied once only and the skin is then treated continuously with croton oil, tumours appear in abundance (Salaman and Roe, 1953). (An interesting recent development, in this connexion, was the discovery that urethane (Haran and Berenblum, 1956) and also carcinogenic hydrocarbons (Graffi *et alii*, 1955) can act as initiators for skin carcinogenesis when injected remotely from the site of subsequent croton oil applications.)

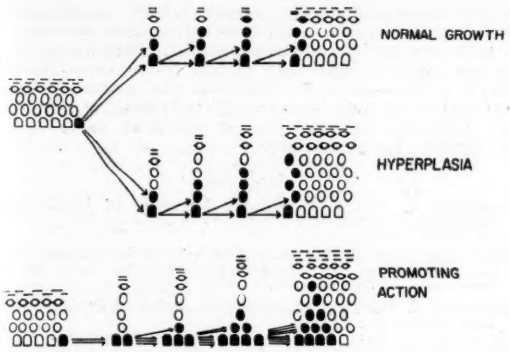

FIGURE VI.

Let us now try to reconstruct, in a speculative manner, the two-stage mechanism of carcinogenesis, and see how far it agrees or conflicts with the over-all picture of tumour pathogenesis.

According to the results discussed so far, initiation would seem to represent a sudden irreversible change in the character of a normal cell, and promotion to represent the encouragement of the changed cell to reproduce progressively, through a delay in maturation. The simplest pattern to fit the picture for initiation would be a mutation. Indeed, to postulate that initiating action is due to a cell mutation is far more plausible than to accept the older hypothesis that carcinogenesis as a whole is due to a cell mutation. But even this limited hypothesis must be viewed with caution, for two reasons: (i) because no one has yet succeeded, after more than 50 years' endeavour, in obtaining any convincing experimental evidence in its favour, though admittedly, no one has succeeded in disproving it either; and (ii) because the alternative "virus theory" of cancer, for which there is ever-growing support, would seem to conflict with the mutation hypothesis.

It may, of course, be argued that a virus is no longer thought of as a microparasite, but rather as mutated genic material, which replicates in the cell it "infects", but which must, in the first place, have arisen through a sort of mutation from a preexisting gene. Is the somatic cell mutation hypothesis, then, so very different from the virus theory of cancer? Could one not suppose that initiating action represented the creation of a newly-formed virus out of a preexisting gene, by a process of mutation, and that promoting action merely served to activate the virus or to stimulate it to divide?

If we are ready to speculate so far, we may as well go further, and suggest a simpler and, at the same time, more daring, imaginary system (Berenblum, 1960). Why not suppose that initiating action merely "liberates" one of the normal genes, responsible for growth equilibrium, from its fixed position? This would presumably give it far greater freedom from control than that of a normally placed gene in the cell. Promoting action might then stimulate the division of the liberated gene, unconnected with the mitotic cycle of the cell, until it would, by virtue of its numbers, dominate the functions of that cell. Such a scheme would have all the advantages of the somatic cell mutation hypothesis, without having to postulate an actual mutation; it would also have all the advantages of the virus theory, without having to postulate the creation of a tumour virus *de novo*. But all this is no more than speculation, without any basis of fact.

Let us, then, leave these flights of fancy, and return to a more factual plane, for a more critical examination of the validity of the two-stage mechanism hypothesis as it applies to skin carcinogenesis. We have already discussed some of the experimental evidence for the hypothesis. Does any of it conflict with other evidence bearing on the subject?

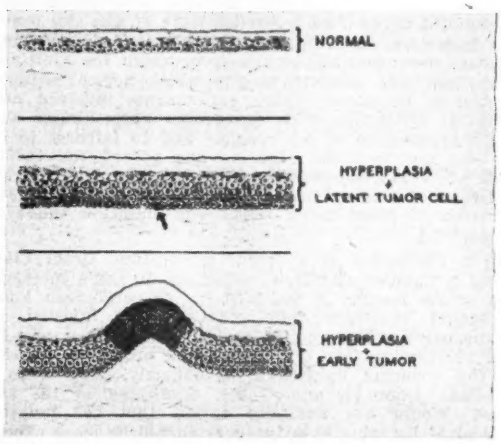

FIGURE VII.

Diagrammatic representation of early development of tumour.

While the broad concept of multiple stages in carcinogenesis is, I believe, generally accepted, one of the underlying principles of the two-stage hypothesis of skin carcinogenesis has been challenged. This is the assumption, implicit in the two-stage hypothesis, that preneoplastic changes are, from the start, focal in origin, probably originating in a single epithelial cell.

Pathologists have always interpreted the histological changes observed in early neoplastic lesions of the skin as developing somewhat diffusely, and Willis (1948), in particular, has stressed the idea of a "field effect", in contrast to a "focal" origin, in skin neoplasia. The conflict is partly real and partly imaginary.

I do not deny the possibility of multiple foci of neoplastic initiation, each focus being capable of developing into an independent neoplasm through appropriate promoting action. Carcinogenic studies in animals have, in fact, shown beyond any doubt that multiplicity of tumour induction is very common—far more common, certainly, than is generally supposed from clinical observations. When such independent neoplastic foci are located close together, they will tend to fuse in one mass, giving the impression of a single tumour. So far, then, there is no conflict between the two views, except for the semantic difference between "multiple tumours fused into one mass, each focus arising independently", and "apparently diffuse cancerization".

One must also remember that the morphological criteria of individual neoplastic cells, with respect to the surrounding hyperplastic cells, are far from exact. No histologist would seriously claim that he can delineate with certainty where the neoplasm ends and the hyper-

plastic epithelium begins. This does not mean that there is a gradual transition from one type of cell to the other, but rather indicates that, in this respect, histology lacks precision.

Far more difficult to reconcile is the concept of the "field effect" as visualized by Orr (Marchand and Orr, 1953, 1955)—that the preneoplastic changes actually take place in the subepithelial tissues, and that no particular epithelial cell is itself committed to neoplasia until shortly before the appearance of the tumour. His views are not purely speculative, nor are they based on morphological criteria alone; but they are actually derived from specially devised experiments. When an initiating stimulus was applied to one area of mouse skin, the treated skin was transferred to a normal site, the normal skin was transferred to the treated site and croton oil was then applied to both areas, the resulting tumours were found not to be confined to, or even to predominate at, the site bearing the transplanted "initiated" epithelium. Indeed, more tumours developed at the site from which the "initiated" epithelium was removed and to which normal skin was grafted in its place. These experiments involved many technical difficulties, with consequent uncertainties as to the interpretation of the results; and in fairness to Orr, he does not maintain that he has proved the indirect mode of action, but merely claims that he has disproved a direct action on epithelial cells. According to Orr (1960), the onus of proof is on those who maintain the direct action.

In a discussion at a recent symopsium, Graffi (1960) raised a number of serious objections to Orr's interpretation of his results. If the initiator (a carcinogen known to induce sarcomas very readily when injected subcutaneously), when applied to the skin surface, acted by first penetrating into the corium and producing its effect on the covering epithelium secondarily, why were no sarcomas produced, under such conditions, at the same time? Would one not also expect that the two-stage method of inducing skin tumours should be more effective if the initiating agent was injected intradermally instead of being applied to the surface, and croton oil applied subsequently? Graffi had tried this procedure, and found it to be ineffective. The bulk of the carcinogen that penetrates, after topical application, is in fact confined to the epithelial cells, as previously demonstrated by Graffi (1939) and others (see Norden, 1953) by fluorescence microscopy studies.

Conclusion.

Many arguments for and against the two rival theories could be brought forward, but the actual solution of the problem must await more exact experimental systems than are at present available. Let us, then, in the meantime, examine some of the implications that may be derived from the evidence presented here, on the assumption that the broad principles, at least, of the two-stage mechanism are valid.

1. The old, lingering belief that "irritation" is an underlying cause of cancer can now be dismissed, not merely as being out-dated, but in fact as serving only to confuse what is already a very complicated problem. In the strict sense of the term, "irritation" is non-carcinogenic. In the more limited sense — i.e., that specific forms of irritation may be carcinogenic—the concept is meaningless. One may as well claim that all pathologically-active agents, to say nothing of all physiologically-active agents, are "irritants". Where does that leave us?

2. The concept of tumour cells remaining "dormant", and requiring additional (promoting) action to awaken them towards progressive growth, may help to account for many otherwise inexplicable clinical observations—e.g., the failure of the majority of malignant tumour emboli to develop into metastases, or the fact that recurrences may appear many years, or even decades, after an apparently successful removal of the primary growth.

3. The concept of two stages in the evolution of a tumour provides one with potentially greater and more varied scope for the prevention or cure of the disease, by offering two points of attack—one at the initiating stage and the other at the promoting stage. The implications, though hypothetical, are obvious enough, and should be kept in mind in long-term planning of research on the prevention and treatment of the disease.

I have attempted, in this short review, to present a picture of the thoughts and tribulations of the contemporary investigator in the field of carcinogenesis, as well as to describe some of the positive results obtained. Though emphasis has been on skin carcinogenesis, I could not avoid going further afield and dealing with some of the broader problems of carcinogenic mechanisms in general.

The picture presented is tentative, as is inevitable in any progress report, and what the future will bring cannot even be guessed. The facts themselves will remain; their interpretations will almost certainly change as more data become available. We have, however, broken the ice, and are now peering into unknown depths. Judging from the progress made in the past twenty years or so in this field, it is reasonable to hope that the advances of the next decade or two will indeed be revealing, and that these will, in time, become of practical value in the fight against human cancer.

References.

BERENBLUM, I. (1929), "Modifying Influence of Dichloroethyl Sulphide on Induction of Tumours in Mice by Tar", *J. Path. Bact.*, 53: 287.

BERENBLUM, I. (1941a), "Mechanism of Carcinogenesis; Study of Significance of Cocarcinogenic Action and Related Phenomena", *Cancer Res.*, 1: 807.

BERENBLUM, I. (1941b), "Carcinogenic Action of Croton Resin", *Cancer Res.*, 1: 44.

BERENBLUM, I. (1954), "Speculative Review: Probable Nature of Promoting Action and its Significance in Understanding of Mechanism of Carcinogenesis", *Cancer Res.*, 14: 471.

BERENBLUM, I. (1960), "Functional Components of Carcinogenesis", *Acta Un. int. Cancr.*, in the press.

BERENBLUM, I., and SHUBIK, P. (1947a), "Role of Croton Oil Applications Associated with Single Painting of Carcinogen in Tumour Induction of Mouse's Skin", *Brit. J. Cancer.*, 1: 379.

BERENBLUM, I., and SHUBIK, P. (1947b), "New Quantitative Approach to Study of Stages of Chemical Carcinogenesis in Mouse's Skin", *Brit. J. Cancer*, 1: 383.

BERENBLUM, I., and SHUBIK, P. (1949), "Experimental Study of Initiating Stage of Carcinogenesis and Re-examination of Cell Mutation Theory of Cancer", *Brit. J. Cancer.*, 3: 109.

FRIEDEWALD, W. F., and ROUS, P. (1944), "Initiating and Promoting Elements in Tumor Production: Analysis of Effects of Tar, Benzpyrene, and Methylcholanthrene on Rabbit Skin", *J. exp. Med.*, 80: 101.

GRAFFI, A. (1939), *Z. Krebsforsch*, 49: 477.

GAFFI, A. (1960), "Functional Components of Carcinogenesis", *Acta Un. int. Cancr.*, in the press.

GRAFFI, A., SCHARSACH, F., and HEYER, E. (1955), *Naturwissenschaften*, 42: 184.

HARAN, N., and BERENBLUM, I. (1956), "Induction of Initiating Phase of Skin Carcinogenesis in Mouse by Oral Administration of Urethane (Ethyl Carbamate)", *Brit. J. Cancer.*, 10: 57.

MACKENZIE, I., and ROUS, P. (1941), "Experimental Disclosure of Latent Neoplastic Changes in Tarred Skin", *J. exp. Med.*, 73: 391.

MARCHANT, J., and ORR, J. W. (1953), "Further Attempts to Analyse Roles of Epidermis and Deeper Tissues in Experimental Chemical Carcinogenesis by Transplantation and Other Methods", *Brit. J. Cancer*, 7: 329.

MARCHANT, J., and ORR, J. W. (1955), "Further Investigation of Role of Skin Components in Chemical Carcinogenesis", *Brit. J. Cancer*, 9: 128.

MOTTRAM, J. C. (1944), "Developing Factor in Experimental Blastogenesis", *J. Path. Bact.*, 56: 391.

NORDEN, G. (1953), "Rate of Appearance, Metabolism and Disappearance of 3:4-benzpyrene in Epithelium of Mouse Skin After Single Application in Volatile Solvent; Microfluorescence-Spectro-Analytical Study", *Acta path. microbiol. scand.*, Suppl., 96: 1.

ORR, J. W. (1960), "Functional Components of Carcinogenesis", *Acta Un. int. Cancr.*, in the press.

PULLINGER, B. D. (1941), "Correlation Between Carcinogenic Potency and First Skin Reaction to Certain Hydrocarbons", *J. Path. Bact.*, 53: 287.

SALAMAN, M. H., and ROE, F. J. C. (1953), "Incomplete Carcinogens: Ethyl Carbamate (Urethane) as Initiator of Skin Tumour Formation in Mouse", *Brit. J. Cancer*, 7: 472.

SETÄLÄ, K., and EKWALL, P. (1950), *Acta Un. int. Cancr.*, 7: 160.

SHUBIK, P. (1950), "Studies on Promoting Phase in Stages of Carcinogenesis in Mice, Rats, Rabbits and Guinea Pigs", *Cancer Res.*, 10: 13.

THE INCIDENCE OF ANÆMIA IN GENERAL PRACTICE IN NEW SOUTH WALES.[1]

Recorder: R. D. SPOONER, M.R.C.P., M.R.A.C.P.,
Cairns, Queensland.

THERE have been numerous previous reports on the incidence of anæmia in populations and various population groups (Medical Research Council, 1945). In many of these surveys the subjects were volunteers from apparently healthy sections of the community (Walsh *et alii*, 1953), and the act of volunteering may of itself have resulted in selection. The results, therefore, may not necessarily be applicable to conditions of general practice in our own community.

The objectives of the present survey were two in number: (i) to determine the incidence of anæmia in general practice in New South Wales; (ii) to determine the value of the copper-sulphate "hanging drop" method as a screening test for anæmia in general practice (Phillips *et alii*, 1943).

Methods of Survey.

It is unlikely, with average physical activity at or a little above sea level, that symptoms of anæmia will occur if the hæmoglobin level exceeds 11 grammes per 100 ml. To avoid missing lesser degrees of anæmia due to the normal diurnal variations of hæmoglobin value (Cotter *et alii*, 1953; Cotter *et alii*, 1959), anæmia was defined as a hæmoglobin level of 13 grammes per 100 ml. or less in males, and 12 grammes per 100 ml. or less in females.

The survey was conducted by three general practitioners: one in a residential and semi-industrial suburb of Sydney, one in an outer residential suburb of Sydney, and one in the rural city of Bathurst. Each man screened approximately 1000 consecutive patients. No patient objected to or refused the procedure. Children aged less than 16 years and pregnant females were not included in the survey.

Screening was performed by the copper-sulphate method described by Phillips, Van Slyke *et alii* (1943). The principle of the method is that copper sulphate forms a thin layer of copper proteinate around a drop of blood or plasma, causing cohesion of the drop without altering immediately its specific gravity. The drop will then rise or fall in the copper-sulphate solution into which it has been dropped, depending on the relationship of its specific gravity to the specific gravity of the copper sulphate solution. The specific gravity of whole blood depends on its hæmoglobin content, and on its plasma protein content. When this method is used as a screening test for anæmia, it is assumed that the plasma protein content is within the physiological range. Copper-sulphate solutions were prepared with the same specific gravity as blood containing 13 grammes of hæmoglobin per 100 ml. for the screening of males, and 12 grammes of hæmoglobin per 100 ml. for the screening of females. A drop of capillary blood, dropped from a height of about 1 cm. above the surface of the copper-sulphate solution, first breaks the surface and then falls a short distance. It is then carefully observed for 10 to 15 seconds. If it continues to fall to the bottom of the solution, the patient is assumed to have a hæmoglobin level above the lower limit of normal, and a negative result is recorded. If it remains stationary or rises to the surface of the solution, it is possible that the patient has a hæmoglobin level below the lower limit of normal, and a positive result is recorded.

In those instances in which a positive result was recorded, 5 ml. of oxalated venous blood and two blood films were sent to Dr. R. J. Walsh, Director of the New South Wales Red Cross Blood Transfusion Service, for further investigation. Those subjects who were subsequently found to have hæmoglobin values below the foregoing levels (by the use of photoelectric cell hæmoglobinometer) were regarded as suffering from anæmia ("true positives") requiring specific anti-anæmic therapy. Those who were subsequently found to have normal hæmoglobin values were recorded as "false positives". Patients already receiving therapy at the time of commencement of the survey, whose hæmoglobin values had been below the foregoing levels at the time of commencement of therapy, were recorded as suffering from anæmia.

[1] A survey conducted by the Research Committee of the New South Wales Faculty of the Australian College of General Practitioners in conjunction with the New South Wales Red Cross Blood Transfusion Service.

Results and Discussion.

The Incidence of Anæmia.

As is indicated in Table I, 3078 consecutive patients were studied. Among these there were 40 cases of anæmia, an incidence of 1·3%.

Of the 1452 males, eight were anæmic, an incidence of 0·55%. Of the 1626 females, 32 were anæmic, an incidence of 1·97%.

The incidence differed in the three practices taking part in the survey. More cases of anæmia were detected in the semi-industrial practice, and the incidence was lowest in the outer suburban practice. The relevant figures are shown in Table I. The higher incidence in males in the semi-industrial practice may be partly selective, as this practice served an older community. Of the eight anæmic males, five of whom were detected in this practice, only one was below the age of 60 years. However, the age factor does not apply when the females are considered. The average age of the 15 anæmic females in the semi-industrial practice was 44·5 years, and of the six anæmic females in the outer suburban practice 52·5 years.

Table II shows the incidence of the various types of anæmia. Of the 40 anæmic patients, 10, all females, were receiving injections of vitamin B_{12} at the time of commencement of the survey. Two of them had hæmoglobin values persistently below 12 grammes per 100 ml., and in their stained blood films (prepared during therapy), the red cells appeared normochromic and normocytic. None of the 10 has been fully investigated by modern methods. These 10 patients comprise 0·32% of the total.

Twenty-one patients, 0·68% of the total, were found to have iron-deficiency anæmia.

Nine patients, comprising 0·29% of the total, were described as having normochromic anæmia of various ætiology, without further qualification.

The Value of the Copper-Sulphate Method as a Screening Test.

Table III shows that in the 3078 screening tests performed by this method, 133 positive results were recorded. On further investigation, it was found that 101 of these were "false positives", only 32 patients being truly anæmic according to the original definition.

Table III also shows that a much higher number of "false positives" was recorded by Observer C than by the others. This is partly due to the fact that Observer C conducted an initial pilot survey, in the course of which certain technical difficulties were eradicated. However, the same observer continued to record the highest number of "false positives" throughout the remainder of the survey, although not as frequently as during the initial pilot survey.

It is possible that some of the "false positives" recorded during the survey were due to low plasma protein levels; and this may partly explain their higher incidence in the semi-industrial practice serving an older community more likely to have nutritional deficiencies. However, this argument is not supported by a higher incidence of normochromic anæmia in this practice, which would be expected if the argument was valid.

TABLE I.
Incidence of Anæmia.

Observer.	Number of Patients.			Number Receiving Treatment at Start of Survey.		Number with Anæmia Detected.		Total Patients with Anæmia.		Sex Incidence of Anæmia.		Over-all Incidence of Anæmia.
	Male.	Female.	Total.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	
Observer A: outer suburbs	469	531	1000	—	3	1	3	1	6	0·21%	1·13%	0·7%
Observer B: rural city ..	515	532	1047	—	4	2	7	2	11	0·39%	2·07%	1·24%
Observer C: semi-industrial area	468	563	1031	—	4	5	11	5	15	1·07%	2·66%	1·94%
Total ..	1452	1626	3078	—	11	8	21	8	32	0·55%	1·97%	1·30%

It should also be observed that the "false positives" recorded by Observer B (rural city) do not represent the full total. This observer found that he was still getting "false positives" right through the series, and checked many locally before going to the considerable trouble of sending specimens to Sydney.

TABLE II.
Incidence of Main Types of Anæmia.

Type of Anæmia.	Observer A: Outer Suburbs.	Observer B: Rural City.	Observer C: Semi-Industrial Area.	Total.
Macrocytic ..	1	3	6	10
Microcytic ..	2	8	11	21
Normocytic ..	4	2	3	9
Total ..	7	13	20	40

An aternative explanation is that "false negatives" were also occurring, and that lesser degrees of anæmia were being missed. However, Observer A checked 80 of his

TABLE III.
Results of Copper-Sulphate Screening Tests.

Result.	Observer A: Outer Suburbs.	Observer B: Rural City.	Observer C: Semi-Industrial Area.	Total.
True positive ..	7	9	16	32
False positive ..	5	16	80	101
Total positive	12	25	96	133

negative results with a Sahli hæmoglobinometer, and found no "false negatives" among them.

In the same context, two of Observer C's "false positives" deserve comment.

The blood film of one of these subjects, whose hæmoglobin value was 12·15 grammes per 100 ml., was reported as showing "marked variation in the size of the red cells with numerous microcytes and occasional macrocytes and poikilocytes present: and many of the cells show central pallor". The comment on the blood film of the other, whose hæmoglobin value was 12·9 grammes per 100 ml., was: "Has this patient ever had a fractional test meal? She is possibly a mild case of pernicious anæmia about to relapse." The patient was a trained nurse with a history of having received liver injections some years previously while nursing in a public hospital of high repute.

Summary and Conclusions.

1 A survey was conducted of 3078 consecutive adult patients in three general practices in New South Wales—one in a semi-industrial suburb of Sydney, one in an outer suburb of Sydney, and one in the rural city of Bathurst.

2. A total of 40 cases of anæmia were detected, an incidence of 1·30%.

3. Because of the high incidence of "false positive" results, it is concluded that the copper-sulphate method is not a useful screening test for anæmia in general medical practice.

Acknowledgements.

The Research Committee wishes to thank Dr. R. J. Walsh and his officers of the New South Wales Red Cross Blood Transfusion Service for their technical advice, for the supply of materials, for their time and for their patient cooperation. Without their assistance this survey would not have been possible. The general practitioners who took part in the study were Dr. W. Brienl, Dr. R. B. Cameron and the recorder.[1]

References.

COTTER, H., LANCASTER, H. O., and WALSH, R. J. (1953), "The Variations from Day to Day in the Hæmoglobin Value of Young Women", *Aust. Ann. Med.*, 2: 99.

COTTER, H., LANCASTER, H. O., and WALSH, R. J. (1959), "Day to Day Variation of Hæmoglobin Value, Hæmatocrit Reading and Erythrocyte Sedimentation Rate in Healthy Subjects", *Aust. Ann. Med.*, 8: 109.

MEDICAL RESEARCH COUNCIL COMMITTEE ON HÆMOGLOBIN SURVEYS (1945), "Hæmoglobin Levels in Great Britain in 1943 with Observations upon Serum Protein Levels", *Spec. Rep. Ser. med. Res. Coun. (Lond.)*, No. 252.

PHILLIPS, R. A., VAN SLYKE, D. D., DOLE, V. P., EMERSON, K., HAMILTON, P. B., and ARCHIBALD, R. M. (1943), "The Copper Sulphate Method for Measuring the Specific Gravities of Whole Blood and Plasma", *Bull. U.S. Army med. Dep.*, 71: 66; revised in TM8-227, "Methods for Laboratory Technicians", October, 1946: 235.

WALSH, R. J., ARNOLD, J., LANCASTER, H. O., COOTE, M. A., and COTTER, H. (1953), "A Study of Hæmoglobin Values in New South Wales", *Nat. Hlth and med. Res. Coun. (Canberra), Spec. Rep. Ser.*, No. 5.

AUSTRALIAN DAY HOSPITAL.

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A DAY HOSPITAL has special characteristics and possesses values which cannot be provided by any other form of psychiatric care. An out-patient clinic cannot fulfil day-hospital requirements by allowing some of its patients to remain all day, nor can a reception hospital assume a

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[2] Late Physician Superintendent, Graylands Day Hospital, Perth, Western Australia.

day-hospital function by permitting some of its patients to return home in the evenings. There is, in other words, much more to day-hospital care than the mere provision of day-time psychiatric treatment.

In the historical development of the day hospital, two quite different influences can be traced. These have provided the day hospital with a tradition, which distinguishes it from other hospitals and, in some instances, from other day-attendance units.

The first influence was Canadian. Cameron, in Montreal, established the first day hospital; he followed the principle that the day-hospital patient should be so ill mentally that, in the absence of a day hospital, he would require in-patient care (Cameron, 1947). This tradition has led day hospitals to take patients with moderately severe degrees of mental disorder. The only criterion of suitability for admission has been the patient's willingness to attend.

The advantages of day-hospital attendance to the patient are considerable. First, the stigma associated with mental hospital admission is at a minimum, since restrictions on personal liberty are non-existent, and each daily attendance is a voluntary decision on the part of the patient. It is this freedom of choice which seems to ensure that the patient will, in fact, attend regularly. Wherever compulsion has existed, there has been stigma, and this has historically (Dax, 1955) become identified with mental illness and mental patients as well as with mental hospitals. The day hospital presents the patient with a socially acceptable way of obtaining treatment for his complaint. Secondly, the patient remains in the community and with his family. Apart from the obvious advantages in the preservation of the family unit, this makes possible a highly practical and realistic approach to the treatment of personal problems, if they exist, since these can be discussed as they arise, if necessary daily. It is the greatest mistake to think that anything is to be gained by extracting the patient from his environment. Both the patient and his relatives gain much more by day-to-day advice and reassurance, and, in any case, the patient's ability to cope increases rapidly as his mental condition improves. Moreover, there are no problems associated with returning home, as in a reception hospital, so that improvements will be more permanent, relapses should be fewer and there should be less tendency to hospital neurosis and institutionalization. Thirdly, the relatives feel happier when they can see progress for themselves in the home, not merely in a hospital setting. Their occasional participation in either improvements or set-backs makes them allies of the doctor, rather than fearful, doubting or even aggressive visitors to a mental hospital (Ellison, 1955). This doctor-relative relationship can be of the greatest value, both for the individual patient and in a general, educational way.

The second influence was British. In 1948, Bierer founded the Social Psychotherapy Centre in London (Bierer, 1951), which became later the Marlborough Day Hospital. Bierer used his day hospital to practise his own methods of social therapy, so that, by this tradition, the day hospital has become orientated to the full use of occupational, recreational, social and group activities. This is additional to the usual physical methods of treatment and the various individual forms of psychotherapy.

Everything that the patient does is made therapeutic for him, especially his social relationships with the medical and nursing staff and with his fellow patients. A hospital having these characteristics has been aptly termed a therapeutic community. A very good working description of this, together with some details of what it entails from both staff and patient, is given by Macdonald and Daniels (1956).

Any illness, and especially a mental illness, causes a disturbance in the patient's social relationships with other people. Many of the symptoms of a mental disorder are representative of these social difficulties. In the day hospital, because of the emphasis on social therapy, the patient is helped to reestablish social relationships with others. As this occurs, many secondary symptoms disappear and the mental illness can be seen in a purer form, often quite mild and frequently easy to treat. This has happened so often in my experience that I have no doubt that the day hospital itself is therapeutic, without any other medical or psychiatric treatment. This is a tribute to the tremendous forces for recovery existing in interpersonal relationships.

The day hospital may be said to specialize in these methods. Moreover, the out-patient clinic cannot easily provide this type of therapy, because it can rarely act as an integrated unit. The in-patient hospital may be able to provide such an approach, and many are now contriving to do so, but the difficulties are very great. Many of its patients are too ill to participate in social or group activities, or require special nursing attention. A degree of discipline and even certain precautions are necessary in a reception hospital, which militate against an easy-going, permissive community atmosphere. Worst of all, the nursing staff are too often busy with the routine procedures of in-patient care to have time to participate in the lives of their patients; and, when they can, their influence is invariably diluted by the inevitable shift system.

A day hospital is more fortunate. The same team of medical and nursing staff cares for the patient day by day. Owing to the absence of hospital chores, such as bed-making, linen and property checks and frequent meals, the nursing staff have the time to participate in the social treatment of their patients, which is their proper role.

Australia has been relatively tardy in trying out the day-hospital idea. Great Britain is said to have approximately forty day hospitals (Bierer, 1959), and clear evidence of the success of this enterprise is given in an article by Craft (1959), which is an excellent review of day-hospital activity in Britain. On a population basis alone, Australia might now have had ten day hospitals. Moreover, in view of the concentration of a large proportion of her population in a limited number of very large cities, she might have benefited from a higher ratio of day hospitals, since cities are particularly suited to schemes for day care.

Graylands Day Hospital took its first patients on April 17, 1959, and can claim to be Australia's first day hospital. Units taking a proportion of day patients were presumably in existence before this, as they were in Great Britain before 1948, but none could be called day hospitals, in the tradition of Cameron and Bierer. In this description of the first Australian day hospital, the influence of these traditions will be apparent.

The building made available to us had been a sixty-bed in-patient unit and part of the long-stay hospital. Although its proximity to the latter hospital caused some comment when conversion was first considered, the complete refurnishing of the building and its administrative separation from the long-stay hospital were sufficient to make it a unit in its own right, and no real disadvantage has resulted.

The building has made an ideal day hospital. There are two ten-bed wards with cubicle curtaining, and 12 single rooms. Two wards have become activities rooms for handicrafts, art sessions, etc., and a large hut is being converted to give excellent facilities for carpentry and clay modelling. Very pleasant and quite spacious private grounds lie behind the building and are used for gardening, ball games, putting, etc. The old day-rooms have been replanned to provide a lounge, dining room, billiard room and rumpus room. There is a large kitchen and servery. As though in anticipation of its ultimate function, the unit already had two locker rooms, each containing 30 lockers, thus providing day patients with a safe and private place for their personal belongings. There are excellent toilet and bathing facilities. The front of the hospital has become the

reception area for visitors and new admissions; it consists of the receptionist's office, the waiting area and four offices for medical staff and the matron. Remaining facilities are a nurse's station, a sterilizing room, two small staff-change rooms and four very small tête-à-tête rooms for the use of either nursing staff or ancillary workers who may wish to have private talks with patients.

In order to break with stigma or prejudice or similar drawbacks to any new venture, it was decided to furnish the new day hospital as attractively as possible. The result is a colourful, contemporary setting with comforts not unlike those in a good hotel. Any likeness to a conventional hospital is minimized by domestic beds, cubicle curtains in several pastel shades, gay lino-tiles or fitted carpets, comfortable contemporary chairs and a selection of pleasing pictures. The 12 single rooms have fitted furniture and are not unlike passenger cabins on board ship. There are wide, shaded verandas with cane furnishings. A patient has only to reach the waiting area to realize that this is not an ordinary mental hospital.

The patients are expected to arrive at 9.30 a.m. and leave at 4.30 p.m. They attend on week-days only. A private hospital bus provides a service between the day hospital and the local railway station at appropriate times. The patients have a hot lunch, dining with the nursing staff, and the usual morning and afternoon tea-breaks. The serving of such meals, the clearing of tables and the washing-up are all community activities, so that only one kitchen worker is required to deal with the provision of meals for 60 patients each day.

The criteria for admission are strict: the patient must be too ill for out-patient care, yet sufficiently *compos mentis* to agree to some sort of treatment for his condition. Many young schizophrenics, even in an acute stage, do well if they can be persuaded to attend regularly, as also do most depressed patients, especially those in the involutional period. It is surely beneficial to avoid mental hospital admission for the patient who develops his first illness in the climacteric. Many such patients have been grateful for this approach at Graylands. Fleeting suicidal thoughts are common in any type of depression, but these are very different from a suicidal intention, based on a conviction of gross unworthiness. Most depressives, even moderately severely affected, are in the former category and can be treated very successfully in a day hospital such as this, where nursing attention is good and communication between medical and nursing staff is easy and flexible.

All the usual physical therapies are carried out, with the exception of continuous narcosis and insulin coma therapy. With all the present-day varieties of tranquillizer available, it is not considered that these two techniques are a serious omission in a modern treatment programme, though they may have some advocates. Individual psychotherapy, at all levels of complexity, is exceedingly important and is limited only by the time available to the medical staff. To some extent, any deficiencies are made up by nursing therapy and group therapy.

The nurses are sisters trained in general nursing. They were selected mainly because of what appeared to be good personality traits, and partly because of their extra-mural interests. The former have helped them to develop into excellent social therapists, and the latter, to enable them to be responsible for practically the whole programme of occupational and recreational activities.

There were approximately 60 applicants for eight positions on the trained staff, which made this type of selection possible. This response to a single advertisement illustrates that there is available a large reservoir of general-trained nursing staff ready to work if day-time duty can be arranged. Their lack of psychiatric training has been no disadvantage, though they were rapidly orientated to the special problems in psychiatry by lectures and case conferences every week. No difficulties were experienced in their managment of psychotic male patients. There is, indeed, some evidence that psychotic men respond well to feminine influence, provided by a mixed patient community and an all-female nursing staff.

The sisters were asked to participate in the activities of the patients. They were encouraged to allow patients to talk to them about their personal histories and special problems. Their early instructions were merely never to give advice. This was a precautionary measure, since it takes a good deal of experience to know when to advise or intervene. Being entirely new to psychiatry, and therefore unbiased, they undertook this form of nursing therapy willingly and with great interest. There is no doubt that this attitude contributed largely to what might be called the "atmosphere" in the day hospital of hope, friendliness and freedom for self-expression. Many patients had never before experienced the forces inherent in close interpersonal relations of this type, and some derived a social confidence they had never previously possessed.

The programme of activities consisted of conventional handicrafts, with leather work, plastic string work, stool covering, dressmaking, etc., together with clay modelling, art sessions, play readings, music appreciation groups, ballroom dancing, country dancing, physical exercises to music, group singing, walks, basketball, putting, and the usual table-tennis, billiards, draughts, chess and cards. Those preferring more solitary activity would engage in gardening or flower-arranging. Plans were afoot for carpentry and cooking as additional activities. This type of programme brought the hospital to life and was an inspiration to both staff and patients. The aim was not to provide rehabilitation, but merely to produce some happiness and the desire to mix, and perhaps to heighten the capacity for self-expression. This function, and especially the use of creativeness, is discussed in some detail by Dax (1955) with special reference to art. Resocialization did occur in the majority of our patients, often very dramatically. This whole programme, with the exception of carpentry, was borne by the sisters, as part of their nursing therapy.

Additionally, the sisters were asked to provide group therapy. All the patients in the hospital were placed in groups, each of approximately eight members; twice a week, these groups engaged in discussions. A sister presided over each group, but had instructions to be permissive and, initially, to intervene as little as possible. The patients discussed anything and everything, but often they discussed themselves and their illnesses. This free exchange of ideas on previously private topics was of considerable benefit in the encouragement of perspective. Patients no longer felt isolated when their complaints had been discussed and compared with the sufferings of others in the group. Needless to say, a sister in charge of a group of eight patients soon got to know them very well and was in a better position to understand them and treat them as individuals.

As an extension of these group activities, it soon became possible to arrange for a social evening once a month. This function affords an opportunity for discharged patients to retain their interest and ties with the day hospital, and to reestablish, if only for a while, those feelings of social identity which are necessary for continued mental health.

These enlightened approaches to the treatment of moderately severe degrees of mental disorder have been a success in this day hospital. Although it is too soon to draw on statistics, the indications are that this method of psychiatric care is at least as good as that provided by a reception hospital, possibly better, and certainly accompanied by many advantages to the patient not obtainable elsewhere.

Graylands Day Hospital has taken approximately two-thirds of its patients from the reception hospital, in partially remitted states of psychosis. This was under-

taken in an attempt to relieve the very critical bed state in the reception hospital. These patients had been only three or four weeks in the reception hospital, and were transferred on heavy doses of tranquillizer. Their subsequent management involved all the various occupational, recreational and social techniques described earlier; the great majority were discharged in complete remission and reviewed at the out-patient clinic. Although the day hospital has in this way enabled the reception hospital to function more adequately, it is not the day hospital's prime function to take partly remitted or convalescent patients. The day hospital should be used as an alternative to the reception hospital for the admission of fresh patients. This proper utilization of the day hospital is in the hands of the practitioners who refer patients for admission.

After six months in operation, some 120 patients had been admitted and approximately 70 had been discharged. The readmission rate was naturally negligible in so short a period of time. The daily attendance rate rose steadily in the first few months, and reached a level of 50 to 60 patients per day. Referrals to the reception hospital, after a period of day-hospital care, work out at 5% of the admissions. This "failure" rate is some indication of the attempt to deal with as much severe mental illness as possible. A domiciliary visiting scheme would have markedly reduced even this small figure, since some of these patients became disturbed in the evening and could not be readily treated by mental health service personnel under the present arrangements. If the interests of the patient are really to be paramount, it should be possible to obtain a much closer working liaison between the public service psychiatrists and the private psychiatrists and general practitioners, for a day hospital is, beyond all else, a community enterprise.

Summary.

The day hospital is an entity, with a definite history and certain traditions. The advantages of day attendance are noted, as also are the principles of social therapy in a community setting. No other form of hospital or clinic can provide this.

Australia is relatively backward in the provision of these facilities. Graylands Day Hospital, the first of its kind, is described in some detail. The nursing sister has been placed in a key role as the social therapist.

The day hospital has proved its worth and should be regarded as an alternative to admission to a reception hospital. The ultimate success of this enterprise is now in the hands of the general practitioners, for whom this service exists.

Acknowledgements.

I should like to express my heartfelt thanks to a courageous matron, a devoted charge sister and loyal nursing sisters for their unquestioning support in a new venture, the success of which is theirs. I should also like to record my gratitude to Dr. Digby Moynagh, the Director-General of Mental Health Services, Western Australia, for this unique privilege in bringing to fruition some of his inspiring ideas.

References.

BIERER, J. (1951), "The Day Hospital, an Experiment in Social Psychiatry and Synthoanalytic Psychotherapy", Lewis, London.

BIERER, J. (1959), "Theory and Practice of Psychiatric Day Hospitals", *Lancet*, 2: 901.

CAMERON, D. E. (1947), "Day Hospital; Experimental Form of Hospitalization for Psychiatric Patients", *Mod. Hosp.*, 69: 60.

CRAFT, M. (1959), "Psychiatric Day Hospitals", *Amer. J. Psychiat.*, 116: 251.

DAX, E. C. (1955), "The Social Activities in Mental Hospital Treatment", MED. J. AUST., 42: 25, 57.

ELLISON, R. M. (1955), "Strained Relations", *Lancet*, 2: 1330.

MACDONALD, J. M., and DANIELS, M. L. (1956), "The Psychiatric Ward as a Therapeutic Community", *J. nerv. ment. Dis.*, 124: 148.

ESTABLISHMENT OF A DAY HOSPITAL.

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BECAUSE of the increased emphasis on the treatment of mental illness without admission to hospital, is seems worthwhile to record the establishment of a day hospital within the department of psychiatry of a teaching hospital in Brisbane, and briefly to review the first six months of its existence.

The literature on day-hospital care of psychiatric patients up to 1957 is well summarized by Craft (1957). Individual day hospitals have been reported on by Aron and Smith (1953), by Bierer (1951), by Cameron (1947), by Harrington and Mayer Gross (1959), by Harris (1957), by Lambo (1956), by Moll (1953, 1955) and by Cozin (1954, 1955).

In 1958-1959 a number of other relevant articles appeared. Goshen (1959) emphasized the role of day-hospital care in the newer concepts of the management of psychiatric patients. Freedman (1959) reported on day-hospital care for severely disturbed schizophrenic children, and the World Health Organization Study Group (1957) on schizophrenia recommended day care for the early treatment of some acute schizophrenics. Russian psychiatriy (Craft, 1957) stressed the importance of day-hospital management of approximately one-third of their psychiatric casualties.

A conference on various aspects of the day hospital was held under the auspices of the American Psychiatric Association in Washington, D.C. Its proceedings appeared in a comprehensive monograph in 1958.

Moll drew attention to the following types: the day hospital as an integral part of the psychiatric department of a general hospital; the day hospital affiliated with the general hospital but situated in a different building; the day hospital affiliated with a mental hospital; and the day hospital as a completely separate treatment centre. The unit to be described is of the first type. The question of how such a day hospital should be structured, and the form it should take is discussed by Mack, Loux and Menninger. The differences of opinion reflect the uncertainty associated with newer methods of treatment and the theoretical orientations of the propounders.

The Brisbane Hospital is the largest hospital in this city, containing approximately 1500 beds in its various departments. It is accommodated in a number of multi-storied buildings on a single site two miles from the centre of the city. It houses the Medical and Surgical Professorial Units of the University of Queensland, and provides a large proportion of the clinical material for teaching in the Faculty of Medicine.

The Psychiatric Department functions administratively under the Medical Superintendent and the hospital Board, and academically under the Professor of Medicine. It is housed in two separate buildings, a single-storied one with refractory wards, and a four-storied one with 66 beds for short-stay patients. (four to six weeks). The latter is Lowson House. The Psychiatric Department is staffed by two senior and two junior psychiatrists and four clinical assistants, all part-time, and two full-time resident medical officers. The resident medical officers rotate departments every six to eight weeks. A clinical psychologist, a social worker, occupational therapists and physiotherapists, together with their departments and students in training, are housed in the main building.

The day hospital functions in the main building (Lowson House), and uses the same facilities and ancillary services as the in-patients. An office is set aside for the clinical assistant in charge, who attends for five sessions a week. One assistant in nursing with considerable psychiatric experience spends the whole of her time with the day patients, others take part in the activities from time to time. The resident medical officers administer physical treatments.

In July, 1959, when the day hospital was established, a number of suggestions as to its organization and management were prepared and circulated to staff members (Appendix I). It forms the basis for patient selection, etc., over the period under review—namely, the six months from July to December, 1959.

Patients were referred from a number of sources, and I assessed each for suitability in relation to the criteria in Appendix I. Of the 35 patients referred, five were considered unsuitable on the following grounds: two were acutely disturbed schizophrenics; two had young children and no help at home; one was a psychopathic personality with anti-social behaviour. The sources of referral of the 30 accepted were as follows: from the in-patient department: Lowson House, three, disturbed wards, three; from the out-patient department: after first contact, four, after a period of treatment, 15; by the visiting staff direct, five.

Transfer of patients from a disturbed ward to a day-hospital setting may seem an unusual procedure, but the following three local conditions contribute. (i) Owing to the inexperience of the resident and some of the nursing staff, very minor degrees of disturbed behaviour are promptly transferred out of the open wards. (ii) There are no in-patient facilities for the treatment of intermediate-stay patients (two to six months) in Brisbane other than transfer to the Brisbane Mental Hospital, a long-stay institution whose facilities are taxed to the limit. (iii) The availability of an in-patient service on the same premises favoured the acceptance of more disturbed patients than would be warranted in the case of a day hospital existing *per se*.

There were three male and 27 female patients. The ages were as follows: 12 to 20 years, four; 20 to 30 years, six; 30 to 40 years, 10; 40 to 50 years, three; over 50 years, seven. The abnormally low proportion of males is not related to general morbidity in the department, which is of the order of the usual two to three females to one male. As no male has been considered unsuitable for the day hospital, the reason must lie in the attitudes of the referring psychiatrists.

The psychiatric diagnoses were as follows: schizophrenic disorders, five; manic-depressive disorders, five; involutional depression, two; anxiety reaction, four; hysterical reaction, four; neurotic depressive reaction, eight; psychoneurosis with somatic symptoms, one; juvenile behaviour disorders, one. The small proportion of psychotic depressive illness reflects the prevailing practice in this area of treating patients with all but the mildest of depressions as in-patients. Given the help of reliable relatives, many more could be managed as day patients.

Craft (1957) has shown in a well-documentated study that the recovery rate from depressive illness is the same in the day-hospital setting as among in-patients, and there are indications from his study that the period of treatment is shorter under day-hospital care.

The psychiatrists referring patients may be listed as follows: Dr. A., 12; Dr. B., eight; Dr. C., three; Dr. D., two; Dr. E., two; Dr. F., two; Dr. G., one. The number of referrals from individual sources probably reflects knowledge of or experience in this type of treatment.

The various individual treatments undertaken were as follows: psychotherapy—supportive, 25; insight, five; drug therapy, six; subcoma insulin therapy, one; electroconvulsive therapy, four; environmental manipulation, eight. Of course, each patient taking part in the group activities may respond to the therapeutic influences of the *milieu*.

The importance of the day-hospital *milieu* as a therapeutic tool has been emphasized by Bierer (1942, 1944, 1948, 1951) and criticised by Sutherland (1951). That group identification proceeds more rapidly and personal difficulties are acted out more obviously in a "family" setting is undoubted. The separation of the day-hospital group from the in-patients, even though they occupy the same areas and use the same facilities, has been one of the most obvious features of this project.

The day hospital has been fortunate in having a senior nurse whose personality provided a kind but firm mother figure to whom the patients could relate. An analysis of these relationships and their therapeutic uses is beyond the scope of this report, but it may well form the subject of further investigation. The interpersonal relationships, working out of problems and mutual support of one patient by another or by the group as a whole, while in themselves valuable, would be more effective in a setting of formal group psychotherapy. This is impracticable with the present level of staffing.

Day-hospital treatment has much to offer the psychoneurotic. The domestic disruptions associated with admission to hospital, and the regressive nature of this form of management, hinder rather than help the adjustment of these patients to their interpersonal difficulties. This point of view has been argued forcibly by Bierer (1951), by Cameron (1947), by Craft (1957) and others, and seems fairly well established in both theory and practice.

All patients received some form of psychotherapy, mostly of a supportive or relationship type. In five cases, however, a more intensive type of psychotherapy aimed at the promotion of insight was carried out after the method of Finesinger.

The method of selection of these five cases was rather arbitrary, but they had certain features in common, namely: (i) the patients were moderately disturbed; (ii) they had had long periods of in-patient and out-patient care; (iii) various physical treatments had been tried without effect. Electroconvulsive therapy was used less frequently than is the case with in-patients. On the one hand this is due to the small number of psychotic depressions, and on the other hand to my own theoretical orientation.

The fate of the patients admitted to the day hospital was as follows: discharged 10, lapsed six, continuing treatment nine, admitted to in-patient department four, admitted to out-patient department one. The results were: recovered five, improved 13, unchanged 11, worse one.

The number of patients who failed to continue (six) is high, but no higher than that recorded by Aron and Smith (1953) and by Harris (1957). Three of the "lapsed" patients were originally admitted to the day hospital with some misgivings as to their suitability for this type of management.

The problem of selection is difficult with any new type of treatment. This was emphasized by Mack and Tobin at the Day Hospital Conference of the American Psychiatric Association in 1958. Errors are inevitable in the initial stages.

The results, from the psychiatric point of view, are not outstanding, and unfortunately there are no published results of in-patient treatment in the department with which to compare them. There is the usual small proportion of patients recovered, and a much higher proportion of patients who, though relieved of their presenting symptoms, may relapse.

From an administrative point of view, however, a gain is apparent. One patient, a chronic psychoneurotic, had been an in-patient for the greater part of the preceding two years. She is now functioning at home and looking after her house and family. Two other patients were to be transferred to the Brisbane Mental Hospital to become a charge on the in-patient facilities of the Department of Mental Hygiene. In the absence of day-hospital facilities, 20 patients would have required admission at the time of the referral. Yet another patient had been a regular attender at the medical out-patient department for three years. This has ceased.

In order to test the possibility of the day hospital's further relieving the strain on in-patient beds, an assessment was made of the suitability or otherwise for day-hospital care of all the in-patients of the two senior psychiatrists at one period in December. The assessments were made independently by the seniors concerned,

by a junior psychiatrist, recently returned from post-graduate studies abroad, and by myself.

The senior psychiatrists considered that four of their 51 patients were suitable and the junior psychiatrist that 19 were suitable, and my assessment included 16 patients. This difference of opinion perhaps indicates the different attitudes of the assessors, or habitual usage of in-patient facilities, or failure to appreciate what the day hospital has to offer, or a disinclination to accept the theoretical risk of patients being at home for part of the day, or a combination of all these factors. A more extensive use of the day-hospital facilities would materially reduce the waiting list for in-patient beds.

A programme of activities appears in Appendix II. It is to be noted that it is not as detailed as, for example, that of the Menninger Clinic, described at the American Psychiatric Association Conference in 1958. This is purposeful, and aims at fostering individual leadership and decision in group activities.

A degree of "permissiveness" characterizes the relationship between patients and staff. "Permissiveness" does not mean lack of discipline, but rather it describes the attitudes and actions of the psychiatrist which enable the patient to determine the extent and limits of his own behaviour. It is to be considered as a useful technical device, not as an attitude classifiable as good or bad. It is of fundamental importance, and has been discussed in its general relationship to psychotherapy by Finesinger and Sheppard (1959).

Thus, although the day hospital functions from 9 a.m. to 4 p.m. for five days a week, in certain cases part of this time may be spent outside the confines of Lowson House. Patients with fears of travelling or of crowds go on occasional shopping excursions, while others, reaching the end of their treatment, may work for one or two days per week, attending the day hospital at other times. The latter is at variance with the original scheme of management, which demanded attendance on five days per week, but has been found necessary in certain cases, as the structure and function of the unit have become more defined and dependency reactions somewhat difficult to control.

Comment.

In the light of the first six months' experience, it is proposed to offer the following suggestions for the future.

1. It seems that a case could be made out for the continuance of the day hospital experiment from both a psychiatric and an administrative point of view.

2. Departures from the original scheme for organization and management (Appendix I) deserve attention, as follows. (*a*) The number of days per week spent in the day hospital may be reduced in certain cases, as has already been mentioned. (*b*) Restriction of admission to patients who would otherwise require in-patient treatment seems valid. Patients who require psychotherapy more than once a week, but who do not need the other facilities of the day hospital, should be managed as out-patients. (*c*) In connexion with the psychiatric diagnoses, experience has confirmed that of Bierer (1944) that the proportion of schizophrenics must be low and their disturbance minimal. A disturbed schizophrenic causes a rapid deterioration in group cohesion and adversely affects individual members. It has been found that antisocial behaviour in psychopathic personalities can be tolerated up to a certain degree; each case must be considered on its merits. (*d*) There is no reason why the day hospital could not provide a diagnostic service. This is merely a question of adequate staffing. (*e*) The need for the presence of a responsible relative to provide support in the evenings, and to ensure the patient's continued attendance, has been amply confirmed. For three of the patients who lapsed, this condition was not fulfilled. (*f*) A certain degree of elasticity in relation to housewives with young families and little help is essential. Each case must be considered on its merits. (*g*) While a maximum period of stay in the day hospital is a useful theoretical concept, is runs into practical difficulties of implementation owing to the type of patients referred—for example, chronic neurotics with marked dependency reactions, and those with depressive illnesses unresponsive to electro-convulsive therapy. (*h*) The formation of a social club, while still considered important, has not been implemented, owing to staffing difficulties.

3. The present level of staffing is barely adequate to handle the number of patients currently being treated, and certainly would be inadequate to handle any increases that might accrue from a more enlightened use of the facilities. It has been said that when there is a waiting list for the day hospital, and none for in-patients, a psychiatric department is fulfilling its function adequately. Whether or not this is true, a waiting list for both facilities implies the need for further staff.

4. Undoubtedly a senior psychiatrist should be in charge of the day hospital (American Psychiatric Association Conference, 1958; Harris, 1957). A part-time appointment would be adequate. The number of unknowns associated with any new methods of treatment require the constant availability of informed opinion for those who are carrying on the day-to-day management of patients. A clinical assistant and the part-time services of one of the resident medical officers in the psychiatric department could form the day-hospital team for an initial period of expansion.

5. The selection of nursing staff to work with day patients is of importance. A high degree of emotional stability is required as in any psychiatric nursing, and such staff should be selected in consultation with the senior psychiatrist in charge (Harris, 1954).

6. The physical facilities are quite adequate to deal with a greater case load.

7. The day hospital can provide facilities for the teaching of both undergraduates and nurses, in addition to their training with in-patients and out-patients, by virtue of the fact that patients may be held in the day hospital for longer periods of time than is customary with in-patients. There is ample material for post-graduate training, particularly in the field of inter-relationships within groups.

8. The ancillary workers have been both helpful and encouraging, and have displayed interest by attending an informal weekly discussion group centred around day-hospital patients. More use should be made of such staff meetings in planning patient management.

Acknowledgements.

I should like to pay tribute to the staff, medical, nursing and ancillary, without whose interest and cooperation the experiment of the day hospital would have been impossible. My thanks are due to Dr. A. D. D. Pye and the North Brisbane Hospital Board for permission to publish the material.

References.

ARON, K., and SMITH, S. (1953), "Bristol Psychiatric Day Hospital", *J. ment. Sci.*, 99: 564.

BARNARD, R. I., ROBINS, L. L., and TETZLAFF, F. M. (1952), "Day Hospital as Extension of Psychiatric Treatment", *Bull. Menninger Clin.*, 16: 20.

BARNARD, R. I., and ROBINS, L. L., and TETZLAFF, F. M. (1952), "Hospital without Beds", *Menninger Quart.*, Spring.

BIERER, J. (1942), "Group Psychotherapy", *Brit. med. J.*, 1: 214.

BIERER, J. (1944), "New Form of Group Psychotherapy", *Proc. roy. Soc. Med.*, 37: 208.

BIERER, J. (1949), "Modern Social and Group Therapy", in Harris, N. G. (editor), "Modern Trends in Psychological Medicine, 1948", Harper, New York.

BIERER, J. (1948), "Therapeutic Social Clubs", Lewis, London.

BIERER, J. (1951), "The Day Hospital", Lewis, London.

CAMERON, D. E. (1947), "The Day Hospital", *Mod. Hosp.*, 69: 40.

CAMERON, D. E. (1956), in "The Practice of Psychiatry in General Hospitals", Bennett, A. E. (editor), Univ. California.

COZIN, L. Z. (1954), "The Place of the Day Hospital in the Geriatric Unit", *Practitioner*, 172: 552.

COZIN, L. Z. (1955), "The Place of the Day Hospital in the Geriatric Unit", *J. soc. Psychiat.*, 1: 33.

CRAFT, J. M. (1957), "Day Hospital Treatment in Psychological Medicine", M.D. Thesis, Univ. London.

CRAFT, J. M. (1959), "Psychiatric Day Hospitals", *Amer. J. Psychiat.*, 116: 251.

FINESINGER, J. E., and SHEPPARD, G. K. (1959), "Permissiveness, its Definition, Usefulness and Application in Psychotherapy", *Amer. J. Psychiat.*, 115: 992.

FREEDMAN, A. M. (1959), "Day Hospitals for Severely Disturbed Schizophrenic Children", *Amer. J. Psychiat.*, 115: 893.

GILMORE, H. R. (1952), "Some Observations on Treatment in the Terminal Phases of Hospitalisation", *Amer. J. Psychiat.*, 108: 749.

GOSHEN, C. E. (1959), "New Concepts of Psychiatric Care with Special Reference to the Day Hospital", *Amer. J. Psychiat.*, 115: 808.

HARRINGTON, J. A., and MAYER-GROSS, W. (1959), "A Day Hospital for Neurotics in an Industrial Community", *J. ment. Sci.*, 105: 224.

HARRIS, A. (1957), "Day Hospitals and Night Hospitals in Psychiatry", *Lancet*, 1: 729.

HARRIS, A. (1954), "Day Hospital", *Hospital*, 50: 214.

HARRIS, A. (1954), "Day Hospital Treatment in Psychiatry", *Nursing Times*, September.

HARRIS, A. (1956), "Social Aspects of Psychiatric Day Hospital Treatment", *J. soc. Ther.*, 2: 107.

LAMBO, T. A. (1956), "Neuropsychiatric Problems in Nigeria", *Brit. med J.*, 2: 1388.

LAW, M. (1947), *Mental Hosp.*, 4: 7.

MOLL, A. B. (1953), "Psychiatric Service in General Hospitals with Special Reference to a Day Treatment Unit", *Amer. J. Psychiat.*, 109: 774.

MOLL, A. B. (1953), "A Psychiatric Day Treatment Unit in a General Hospital", *Canad. Hosp.*, April.

MOLL, A. B. (1955), "Psychiatric Night Treatment Centre", *Canad. Hosp.*, October.

NEUSTATTER, W. L. (1951), "Treatment of Psychoneurotics, Some Practical Considerations", *Lancet*, 1: 1331.

POTTLE, C. H. (1956), "Day Care in a Mental Hospital", *Hospital*, April.

SUTHERLAND, J. D. (1951), "Review of Bierer's Monograph on the Day Hospital", *Brit. med. J.*, 2: 404.

W.H.O. STUDY GROUP ON SCHIZOPHRENIA (1957), Geneva.

WORTIS, J. (1950), "Soviet Psychiatry", Baltimore.

Appendix I.

The Day Hospital can provide a satisfactory venue for psychiatric treatment, provided its limitations are recognized and its patients carefully selected.

The following suggestions are offered for comment:

1. The Day Hospital functions within the confines of Lowson House.

2. The Hospital is "open".

3. Patients attend for five days weekly—Monday to Friday from 9 a.m. to 4 p.m.

4. The condition of patients recommended should be such that they would otherwise require in-patient treatment.

5. In general, chronic neurotics, patients with depressive reactions and schizophrenics recovering from an acute episode are suitable, while patients requiring treatment in closed wards, or with pronounced anti-social behaviour, are unsuitable.

6. The Day Hospital does not provide a diagnostic service—a thorough work-up with an indication of diagnosis and recommendation for treatment, should accompany the patient at the time of referral.

7. Patients must live in Brisbane with stable and responsible relatives to provide support in the evenings, and to ensure the patients' continued attendance—patients receiving E.C.T. must be escorted home.

8. Harassed, overworked housewives without outside help only have their problems increased by being removed from their homes for seven hours daily, and have been shown to do better as in-patients.

9. The practice of having patients attend for less than five days weekly, defeats the purpose of Day Hospital care, which aims at social as well other types of treatment.

10. A maximum period of stay in the Day Hospital should be determined and made clear to patients on admission—this orientates them towards discharge.

11. With the present level of staffing—viz., one part-time clinical assistant—numbers must be restricted to say 20 patients.

12. Physical treatments are available—individual and group psychotherapy should be.

13. The part-time services of a social worker, occupational therapist, physiotherapist and clinical psychologist, are available.

14. The tentative programme below endeavours to alternate individual and group activities.

15. A social club for current and ex-Day Hospital patients could be arranged in conjunction with the present Sunday evening social for in-patients—it would aid follow-up studies, and provide some necessary supportive treatment.

16. The clinical assistant is available from 8.30 a.m. to 11 a.m. Monday, Tuesday, Thursday and Friday, and from 1 p.m. to 5 p.m. Wednesday.

Appendix II.

Day Hospital Time Table.

8.00	ARRIVE	(E.C.T. Patients Only)		
9.00	ARRIVE	Interviews with Doctor treatment testing, etc.	Under 40 Physiotherapy Group	Over 40 O.T. Handicrafts (Individual)
10.00	TEA			
10.15			Under 40 O.T. Handicrafts (Individual)	Over 40 Physiotherapy Group
11.00			Ex E.C.T. Physiotherapy	
11.45	LUNCH REST PERIOD			
12.30				
14.00		Painting (Individual Activity)		
		O.T. Music Dancing Theatre		Group Activity
16.00	DEPART			

THE ROYAL ALEXANDRA HOSPITAL FOR CHILDREN HEART-LUNG MACHINE.

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General Description of the Machine.

THE machine described herein[1] was developed especially for the Congenital Heart Unit of the Royal Alexandra Hospital for Children, Sydney, and embodies the operative features defined later in this paper. The basic conception involved in this design is an accurate, well-controlled perfusion of adequately oxygenated blood at normal body temperature, to maintain normal homœokinetics. At the same time construction allows for the use of deep hypothermia by a simple attachment to the unit giving accurate and rapid temperature control from 10° to 40° C.

Control by one operator is readily accomplished from a convenient central position in front of the instrument panel of the machine. A minimum of deck space is

[1] The R.A.H.C. Heart-Lung Machine, conforming to the special requirements of the Cardiac Surgical Unit, Royal Alexandra Hospital for Children, Sydney, was developed and constructed by Ebsray Pumps Pty. Ltd., Sydney.

occupied by the equipment, which includes the oxygenator, a heat-exchanger with inbuilt temperature control, an arterial pump of the occlusive type, a coronary sinus suction pump and settling coil and a venous return reservoir. In addition to these features, an arterial filter and bubble trap is located beyond the outgoing side of the heat-exchanger.

The actuation of the arterial and sinus suction pumps is basically hydraulic, and the oxygenator also receives its motivation from an independent hydraulic motor. Power

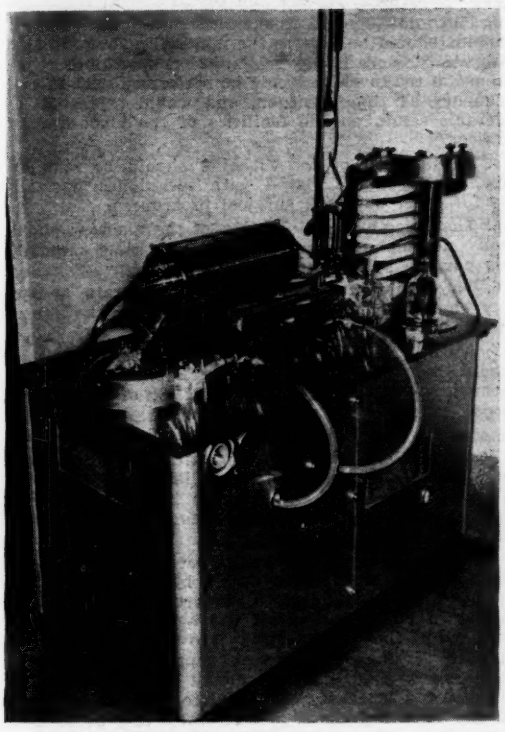

FIGURE I.

In this view, the heat-exchanger, arterial filter, strip light for the oxygenator and bubble-trap for the oxygen line can be seen clearly. Lines from the heat-exchanger go to a water tank situated within the machine.

supply is from a three-phase induction motor, and all lighting equipment is standard 240 volts supply.

Manual operation is provided to cover the remote possibility of power failures. Both pumps and oxygenator spindle can be rotated manually within a few seconds in an emergency.

Primarily the unit has been designed to meet all existing operative requirements of present-day heart surgery; however, with the ever-increasing amount of specialized equipment now appearing in the operating theatre, compactness in design without loss of efficiency becomes essential.

The carriage construction is that of a rigid and light steel frame blended in line with the four corner columns of anodized duralumin. External sheeting of the top plate and front instrument panel is in satin finish and polished stainless steel, the end plates and rear inspection covers being made of anodized aluminium.

Accessibility is adequately provided by easily removable back panels, and the general appearance is enhanced by the entirely concealed location of the mobile swivel ball-bearing castors. The over-all dimensions are: length, 42 in.; width, 24 in.; table height, 26 in.

Centralized control of all components is provided by the carefully grouped instrument panel, which is recessed under the top tray and inclined at the most convenient angle for constant inspection by the operator. Recessed lighting is provided for the entire panel, and a conveniently sited strip light enables an accurate check to be kept on the blood level in the oxygenator without distracting the attention of either the surgeons or the pump

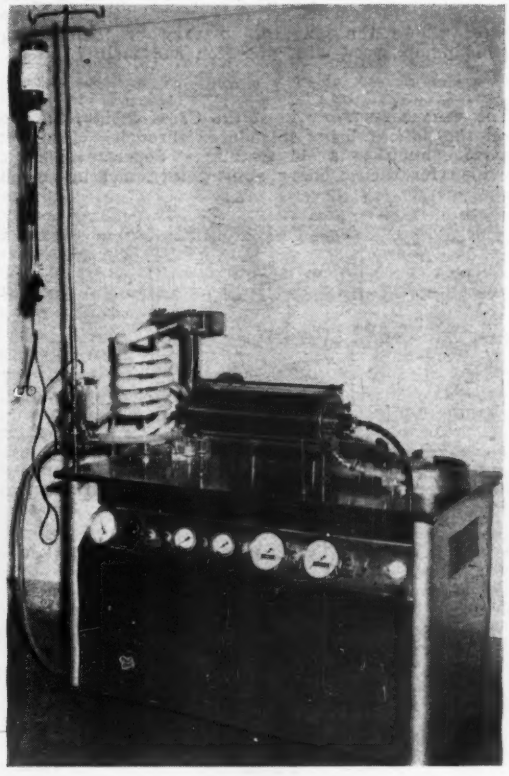

FIGURE II.

The instrument panel shows from left to right: (i) temperature indicator for heat-exchanger; (ii) thermostat control; (iii) pump switch for heat-exchanger; (iv), (v), (vi), (vii) switches and pressure gauges for hydraulic lines; (viii) control for coronary sinus pump; (ix), (x) tachometer and control of oxygenator; (xi), (xii) tachometer and control for arterial pump; (xiii) light switch.

operator. There is a notable absence of noise and vibration during operation of the machine, which emphasizes the high quality of its engineering construction.

After extensive laboratory testing the machine was applied clinically. It has very successfully fulfilled operative requirements.

Pumps.

The design is fundamentally on the roller principle; however, close attention has been given to the method of achieving total occlusion without incurring excessive roller pressure. Manual adjustment of the rollers has been superseded, and the roller stroke volume is accurately balanced. Accurate control of concentricity of the roller beam axis within the tube race has been given special attention.

The pump speed is infinitely variable within the required range, and provision has been made in the design for operation at very slow rates when required. Tubing size may be varied as desired, the tubing being

accurately located within the tube race by means of special split "Acrylic" clamps, which are readily detachable to facilitate insertion of the tubing during assembly. The arterial pump is calibrated to deliver a constant stroke volume, which will not vary to a significant degree despite changes in line pressure produced by alterations in flow rate or cannula size.

A constant stroke volume can be relied upon; this ensures that the calculated perfusion rate will be accurately maintained when the pump speed is preset. A large dial tachometer with a conveniently sited speed control allows the operator to vary or maintain any desired pump speed with precision and facility.

Venous Reservoir.

The venous reservoir is of the Gross design, the blood from the patient being introduced through a fenestrated central column to avoid frothing. Separate inlets are provided for the coronary sinus return and by-pass line

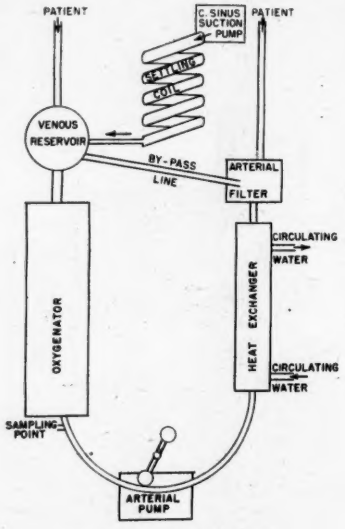

FIGURE III.
This shows diagrammatically the circuit of the pump oxygenator.

from the arterial filter, and there is a wide outlet for connexion to the oxygenator. Priming blood is introduced through a specially designed inlet at the top. Approximately 2 litres of blood are required for priming the entire circuit.

Coronary Sinus Suction Pump.

This is mounted on an extended vertical column and employs the same highly sensitive hydraulic speed-control principle as used in the arterial pump. The infinitely variable speed-control knob is conveniently situated on the front control panel. The elevated location allows the tubing from the coronary sinus sucker to be disposed horizontally, which helps to minimize frothing and trauma to the blood. Separation of air from the blood is achieved in a spiral settling coil, from the bottom of which the blood can be returned to the venous reservoir.

Sampling Points.

Sampling points are provided for insertion as desired. We prefer to insert the sampler on the low-pressure side of the arterial pump between oxygenator and arterial pump. Samples are withdrawn at specified intervals during the procedure, to carry out biochemical examinations and blood gas analyses as a check on the adequacy of the perfusion.

Use of the R.A.H.C. Heart-Lung Machine in Cardiac Surgery.

In deciding to design and manufacture a heart-lung machine in Australia, certain prime considerations were kept in mind.

1. There were manifest advantages in having a machine of local construction from the point of view of maintenance and replacement of parts when necessary.

2. It was essential that such a machine should compare favourably with the best overseas models available, as regards both construction and cost.

3. The total amount of blood necessary for priming the machine should be kept to the minimal amount compatible with safety, since it was realized that operations requiring the use of the machine would be performed with increasing frequency as time went on, and would represent a considerable strain on the facilities of the blood-transfusion service.

4. Sterilization of the machine should be simple, and capable of being achieved with techniques normally in use for other standard surgical procedures.

5. The assembly and cleaning of the machine should be easily accomplished, to minimize the time required for this purpose by hospital staff.

6. The machine should be simple to operate, and preferably should be capable of running under the control of one trained operator.

7. All other basic requirements of a heart-lung machine should be met—for example, reliability, provision for manual control if required, and lack of trauma to the blood.

Total Body Perfusion Technique.

Approximately 2 litres of heparinized blood are required to prime the machine, and an additional 500 ml. of blood are held in reserve. One and a half litres of citrated blood are also ordered, mainly for post-operative blood replacement.

The blood returning from the patient enters the venous reservoir and from there passes by a piece of "Mayon" tubing with an internal diameter of five-eighths of an inch to the venous end of the oxygenator. Inside the oxygenator the blood comes into contact with a large number of discs rotating at approximately 100 r.p.m.; this causes a significant amount of turbulence in the blood and also causes the blood to film out on each side of the spinning discs. Here they are exposed to an atmosphere of oxygen, delivered to the oxygenator at approximately 4 litres per minute, and oxygenation of the entering venous blood takes place.

A 15-inch oxygenator is used for estimated flows up to 2 litres per minute, and a 21-inch model for flows in excess of this. Flow rates are estimated on the basis of 2·4 litres per square metre of body surface per minute.

The blood leaves the arterial or far end of the oxygenator and passes via "Tygon" tubing of 0·5 in. internal diameter through the arterial pump. The speed of the arterial pump can be varied at will, and each rotation of the pump delivers approximately 60 ml. of blood back to the patient.

From the arterial pump the blood passes through a heat-exchanger, where the blood temperature is restored to normal body levels. If desired, the heat-exchanger can be used for either cooling or rewarming the blood by varying the temperature of the water in the jacket surrounding the blood. The heat-exchanger consists of a series of stainless steel tubes, highly polished on the inside, surrounded by a water-jacket through which water at a predetermined temperature is pumped.

From the heat-exchanger the blood passes to a "Lucite" filter, and from the filter via the arterial line it goes through a metal cannula back into the external iliac artery and thence around the body. From the arterial filter a by-pass line can carry the blood directly back to the venous reservoir. This is used when the machine is primed, so that the blood can be kept circulating slowly until the patient is ready to go on to perfusion; then,

by clamping the by-pass line and opening the arterial and venous lines, whole body perfusion of the patient is commenced. All high-pressure connexions are secured by special "O" clips.

On the front of the machine, on the elevated pylon, is a second pump, the coronary sinus pump. To this passes a "Tygon" tube, of an internal diameter of one-quarter of an inch, which delivers blood sucked up from within the heart or pericardium back into a spiral helix; this acts as a reservoir to contain this blood, from which it can be returned back into the venous reservoir, as desired. A quarter-inch to half-inch connexion allows "Tygon" tubing (half-inch internal diameter) to be used in this pump prior to delivery into the spiral helix. This reduces flow velocity and further minimizes any tendency to foaming. No "anti-foam" is used anywhere in the circuit.

There are three phases to total body perfusion, as follows.

1. Partial by-pass. When the by-pass is commenced, and before the tourniquets around the venæ cavæ are tightened around the two venous catheters, only a proportion of the blood from the body is actually passing through the heart-lung machine. The remainder of the blood is running past the catheters and being pumped around the body by the heart itself.

2. Total by-pass. Once the caval tourniquets are tightened, then of necessity all the blood from the body except that returning to the right atrium via the coronary sinus is going through the heart-lung machine for total body perfusion. The coronary sinus blood, once one of the chambers of the heart is opened, is sucked out from within the heart and returned to the machine via the coronary sucker, whence it can be returned to the venous reservoir as desired.

3. Total body perfusion with cardiac arrest. If the base of the aorta is clamped, then not only is the body being perfused, but the heart will be arrested. A still heart is a great advantage during certain phases of the operative procedure, because the still heart allows suturing to be carried out more easily. Moreover, because the aorta is clamped, the coronary sinus return is eliminated, and the view of the operator will be virtually unobscured, as the heart is then completely bloodless.

Conclusion.

The machine has now been in weekly use since December, 1959, after extensive laboratory trial, and has been found to be highly satisfactory at a clinical level. It has been used for the closure of atrial and ventricular septal defects, with and without aortic occlusion, and perfusion times have varied from 15 to 35 minutes.

The results of biochemical studies, blood-gas analysis and alterations to the circulating blood are being carefully tabulated and will in due course form the basis of a publication relating to the specific use of this machine. Indications are that the machine is thoroughly reliable for the purpose for which it has been designed.

RECENT FRACTURES OF THE NOSE.[1]

By A. B. K. WATKINS, M.S., F.R.C.S., F.R.A.C.S.,
Sydney.

WITH the nose so prominently exposed in front of the face, it is only natural that fractures of it are commonest of all head fractures. They are, further, even more common than is usually suspected, some authorities estimating that 50% are never diagnosed. Such fractures are always due to direct injury, but there is a great variation in the force required, depending, of course, on the immense variations in the thickness and strength of facial bones.

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on May 26, 1960.

Unfortunately, the greatest problem in treatment comes from delay. Early diagnosis is, therefore, of paramount importance, unless there is no displacement, when no treatment is necessary. Some excuse may exist for not diagnosing certain cases in which there is considerable soft-tissue swelling; but delay in diagnosis in all cases is still so common that I cannot resist the temptation to harp on the point.

A typical story is that a patient with a straight nose sustains an injury, after which he alleges that the nose is crooked, or more crooked than it was before. The first practitioner to see the patient, not detecting any crepitus, may think that the apparent deflection of the nose is due only to soft-tissue swelling, and he often suggests waiting for this to subside. A few days later the patient becomes dissatisfied, and attends a casualty department, where a resident medical officer advises an X-ray examination. When the patient attends again after the X-ray examination, he is told that a fracture is present, and that he is to go to the ear, nose and throat department on another day. After he has been examined by the ear, nose and throat consultant, there is difficulty in arranging his admission to hospital, and by then so much time has elapsed that his case appears less urgent than it really is, and several more days may elapse (perhaps altogether up to a fortnight) before treatment is commenced.

This sort of thing continues, in spite of regular emphasis on the point by those of us who have to put up with the unnecessary extra work and worry of treating these patients. Whenever possible, the correct time for treatment is the day on which the injury has occurred. The only sensible attitude to adopt is to assume that every patient whose nose is deformed or becomes more deformed after an accident has a nasal fracture with displacement until the possibility has been disproved.

If X-ray examination is not immediately available, owing to lateness in the day or to the accident occurring at the week-end, one should not delay in order to have a radiological examination made, except when a suspicion of malingering exists. Such a possibility must be kept in mind in all compensation cases, for it is not uncommon for persons at work who have deflected noses, to suffer an injury, or to allege that they have suffered an injury, and to state that the nasal deformity they have when examined was not present or was insignificant before the injury.

It proves most embarrassing in such cases if an attempt at simple reduction is made, and the only instruments prepared are those normally used in reducing a recent fracture.

Types of Fracture.

Only a small proportion of these fractures are compound. Among the simple ones, there is an infinite variety of different fractures of the nasal bones, of the ascending processes of the maxilla and of the nasal septum, but from a practical point of view, they can be divided into two chief types. The first is the comparatively rare comminuted fracture with depression of the nasal bridge, whilst the second is the extremely common fracture with the nasal bridge deflected to one or other side. These latter fractures are caused by an oblique or lateral injury, and usually both sides of the skeleton of the nose are fractured and rotation of the fractures on each side takes place in the direction of the injuring force. As a result of this, the fractured bones on the opposite side of the injury stand out more at right angles to the face than normally, and produce a ridge which greatly exaggerates the deflection of the nasal bridge. A lesser variety of this injury is a simple fracture on one side of the bony nasal skeleton with depression.

Diagnosis.

Besides the points referred to already, crepitus, though relatively rare, is absolute evidence of fracture. X-ray examination is useful when swelling obscures the issue

or the patient's statement is suspect. Where time permits X-ray examination is advisable, as in all fractures in case of subsequent litigation. Sometimes, however, the X-ray film leads one into error, as an already healing or recently healed fracture of the nasal bones is reported as a recent fracture. This is not likely to happen if the possibility is remembered, a recent fracture having, of course, much crisper edges than a partly healed one.

Lateral X-ray films of the nasal bone are sometimes grossly overexposed, and others may need to be taken. A vertical X-ray examination with the film held partly in the mouth is the most reliable in difficult cases.

Treatment.

No treatment is required unless there is displacement. In other cases, early reposition is necessary. In massive compound injuries with comminution, it is extremely seldom necessary to remove any bone. Only pieces completely separated from all attachments and quite loose should ever be discarded.

Because of the superlative blood supply of this area, *débridement* is seldom necessary, and when advisable should be very restricted.

When comminution with depression is present, reposition is easy; but collapse immediately recurs, and internal splinting becomes necessary. Packing can scarcely be kept in long enough, and dental composition on stylet wire has a place in treatment, but I have not found anything so useful as my modification of Carter's splint. This has the advantage of greater adaptability. Also, pressure on external wounds can usually be avoided by adjusting the external points of counter-pressure.

I cannot sufficiently condemn the practice of attempting to rectify the lateral rotation displacement in a simple fracture without an anæsthetic. It must be done thoroughly, and any impaction must be completely freed. This is done by inserting one blade of Asch's or Walsham's forceps in the nostril while the other lies on the skin. I get a better grip by having no rubber on the blade of the forceps in the nose, but use rubber on the outside blade to help to avoid marking the skin. The fractured sides of the nose are then rotated free consecutively; but in this connexion I must point out that one should first mobilize outwards the side on which the injury has occurred, in order to make room for the internal rotation of the opposite side subsequently. If the order is reversed, unnecessary injury or locking of the fragments occurs.

Where one can operate within a few hours of injury, the fractured bones usually snap into place, and sometimes show no tendency to go back into the displaced position. These fractures I do not splint. However, when more time has elapsed, there is a greater tendency for the deformity to recur, and if after a few minutes there is the slightest tendency for the deformity to do so, I mobilize the fractured portions very freely and also apply splints.

Formerly I used internal packing for a few days with external application of plaster of Paris for a fortnight to three weeks. This method I abandoned, because whatever form of splint is used, it will become loose as the soft tissue swelling subsides. I therefore prefer to use dental composition, which I remould every few days, though sometimes I alternate this by packing the splint inside with strips of strapping as the nose progressively shrinks during healing.

With delay in treatment of over two weeks, there is a proportion of fractures that cannot be adjusted by such simple treatment; but first I suggest that reasonable force should be used as already described. If this does not readily accomplish disimpaction, the incisions between the upper and lower alar cartilages usually made at the beginning of a routine nasal reconstruction are made, and by dissecting upwards a subcutaneous pocket is made on each side over the nasal bone and ascending process of the maxilla, and one blade of Asch's or Walsham's forceps is then inserted in the nasal cavity and one in the pocket, both without rubber coverage. Bone can then be firmly grasped, and much more force can be exerted. Also, what force is used is transmitted better to where it is required.

This procedure will work in some cases up to four or five weeks; but undue force is liable to produce further fractures without reduction of the old one, and if one cannot succeed with what experience suggests is reasonable force, the operation must proceed along the lines of nasal reconstruction, the bones being divided and adjusted with saws and osteotomes.

In cases of long standing, one of the nasal reconstruction operations is required, followed by splinting up to three weeks. Even with every care, such patients sometimes require more than one operation before the nose can be induced to remain in the mid-line. In fact, such fractures are far more difficult to cure than the other common nasal deformities, such as hump nose, long nose, etc. This fact throws further emphasis on the importance of early treatment, which is usually simple, satisfactory and free from after-discomfort to the patient.

FRACTURES OF THE MAXILLA.[1]

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FRACTURES of the malar maxillary compound are inclined to be complex and variable. The mandible is a strong bone of simple structure, and tends to break more or less according to the rules of long bone breakages. The nose is a relatively weak structure, comprised largely of membranous bone and cartilage, and is easily broken up. The maxilla is an interesting mixture of strong, boldly-designed struts and weak interposed osseous tissue. Its fracture implies usually fracture of the supporting beams and crushing and comminution of the membranous bone. One has only to look at the osseous structure of the middle of the face to understand that fractures here can often be of great complexity. In its normal state, the maxilla is of course fixed to the cranium, with no provision for movement and consequently no muscles subserving movement. Hence pain is not normally significant in these fractures. Great swelling can occur with great rapidity, often from direct effusion of blood, so that frequently people who have sustained these fractures are virtually unrecognizable. Bony landmarks may be hard to define. Swelling quickly masks depression. Not infrequently there may be extensive soft-tissue damage associated with such fractures. The constant and not unnatural reaction of the attending doctor is: "Well, at least here is something that I can deal with." So he carefully sews up the skin wounds and orders some X-ray films. It is often difficult to obtain good X-ray pictures of these swollen, sick and irritable people, so often the pictures are inadequate and the examination has to be repeated, perhaps on more than one occasion. There may, too, be associated injuries—for example, a fractured skull with compression or cerebral irritation, or thoracic injuries, or long-bone fractures—which by their nature engender priority treatment.

All these factors, the relative absence of pain, the great swelling masking bone deformity, and questions of associated injury, tend greatly to delay definitive treatment. Yet in the whole of the body there is perhaps no bony complex more deserving of relatively urgent treatment than is the maxilla. For the very reasons of its complexity of structure, its plentiful blood supply and its fixity, union, however malopposed, tends to occur quickly and is often remarkably solid after ten to 14 days. It is my opinion

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on May 26, 1960.

that these maxillary fractures have been, and all too often still are, the worst-treated fractures in the body.

What, then, are the sequelæ of neglect or mal-union? (i) Facial disfigurement; this may be very gross, permitting of degrees of flattening and broadening of bone structure, or gross asymmetry. (ii) Orbital compression or displacement; here the classical problem is downward displacement of the orbit, with vertical diplopia, which no lens will correct. Enophthalmos is not uncommon and appears to be related to absorption of retro-orbital fat. Its actual causation is somewhat uncertain, and therefore it is not always preventible. (iii) Restriction of lower jaw movement; sometimes this is present to the extent of almost complete trismus. (iv) Constriction of the infra-orbital nerve; this may be accompanied by continuing pain or numbness. (v) Cerebro-spinal rhinorrhœa; this is a dangerous condition, sometimes requiring neurosurgical intervention and fascial repair of the dura. (vi) Antral infections and mechanical problems arising from distortion. (vii) Dental insufficiency. These matters are of great importance, far-reaching to the individual and greatly significant in courts of law.

Fractures of the maxilla are arbitrarily divided into two categories: (*a*) resulting from central violence; (*b*) resulting from lateral violence. The first (central) group are more or less symmetrical fractures, and may be of any extent from a simple depressed fracture of the nose to a total collapse or disruption of the whole central area of the face. Equally, those from lateral violence vary from the simple depression of the zygomatic arch or malar bone to all degrees of total disruption. There are many varieties.

Can we define a general approach to these injuries? The following principles can be established. (i) Although soft-tissue repair is important, restoration of bone structure should have absolute precedence in treatment. (ii) Bone restoration is urgent and must not be delayed. (iii) Fixation must be as definitive as possible.

If the teeth are out of occlusion, or if there is evident mobility of the alveolus of the upper jaw, as a general rule the main part of the maxilla is mobile and therefore separated from the skull. Naturally a local alveolar fracture or associated mandibular fracture will also distort occlusion. In other instances, fixation of the alveolus to the cranium is not disturbed, there being a limited central fracture or any of the variety of lateral fractures on one or other side. In the presence of alveolar mobility, skilled dental and prosthetic cooperation is essential in planning treatment.

Now let me briefly summarize the various procedures which may be required in varying types of fractures.

Unilateral Malar-Maxillary Injury.

1. Temporal elevation. This is undertaken through a small temporal incision. Remember that the temporal fascia is attached along the line of the zygomatic arch, so that an elevator passed deeply to this strong fascia necessarily passes immediately deep to the malar zygomatic line.

2. Antrostomy through the buccal sulcus. The bone is already comminuted in most of the cases in which this procedure is required; hence the removal or nibbling away of a few loose pieces gives good access quickly. Often the crushed antral wall can best be spread and reconstituted by the insertion of a finger inside the antrum. We have in such cases in the past 20 years as a routine procedure packed the antral cavity firmly with ribbon gauze soaked in Whitehead's varnish. This procedure, maintained for 10 days or so, does a great deal to maintain the repositioning of the mosaic of comminuted thin bone, and does much to reconstitute the antral cavity.

3. Exploration and open wiring of the fronto-malar junction. This is a key point, and definitive fixation of this firm buttress can sometimes do much to reestablish the whole line of the outer and caudal orbital wall. Further, it establishes the fulcrum over which rotatory correction of the main body of the malar bone can be made and maintained.

4. Open exploration and sometimes wiring at the main infraorbital site of fracture. This allows, further, of complete freeing of orbital fascia from the fracture line. It has always seemed that the worst cases of diplopia arise when there is severe "catching up" of orbital fascia in the fracture line.

5. Direct wiring of the zygomatic arch, occasionally.

6. The insertion of a wire through the infralateral margin of the malar bone. This may sometimes be used, since it permits direct outward traction to an attachment fixed to a plaster head cap. In very unstable fractures this may be a procedure of great value.

7. Roger Anderson pins. These may be used in the same way with traction, but have been found less satisfactory.

Total Fractures with a Mobile Maxilla.

1. Forcible manipulation and thorough disimpaction. This may be done with Walsham forceps or lion forceps to hold and move the main alveolar arch.

2. Nasal manipulation. The whole bone structure may be depressed well back behind the frontal level, and must be brought forward.

3. Fixation forward. This is often maintained by the insertion of two mattress wires tied over dental rolls on each side, and then, if required, brought forward for subsequent attachment with or without elastic traction to a plaster headcap.

4. Any or all of the procedures mentioned for the treatment of the lateral cheek-compound fracture.

5. Application of upper and lower cast metal splints and provision for intermaxillary fixation.

7. Special measures for edentulous patients. Either an alveolo-palatal tray can be provided and fixed with forward attachment to a headcap, or some system of skeletal wiring may be used. Sometimes it is convenient to bring the wires from the alveolar margin up through the cheeks on each side, for attachment to a headcap.

It is evident that in these cases the closest cooperation with skilled, specially trained dental surgeons is quite vital. Indeed, it is completely wrong for any surgeon, however skilled, to try to deal with these cases without such help. Naturally, treatment of floating fractures of the maxilla is greatly complicated when significant fracture of the mandible is present in the same patient. I feel sure that when told of any such patient, Dr. John Baird would first ask the question "What teeth are standing?" So should I. Teeth are wonderful things to hang splints on. Conversely, the complex fractures of the mandible and maxilla in elderly or edentulous patients can present great problems in regard to fixation.

Conclusion.

So we have each, in the brief time available, tried to summarize a few of the significant aspects of these facial injuries. We have divided the subject anatomically. Injury, of course, does not do that. We have restricted ourselves to discussion of bone and cartilage restoration, and it can be emphasized once again that, whether about the nose, mandible or maxilla, restoration of basic skeletal structure should have precedence over soft-tissue repair. We have, I feel, only touched the fringes of the subject.

In the last world war, units of facio-maxillary and plastic surgery were established by British, American and Australian forces in the various theatres of war. Since the war, units have been established at most large hospitals.

In my opinion these patients should go to such units, without quibbling or delay.

VENOM YIELDS AND TOXICITY OF THE VENOMS OF MALE AND FEMALE TIGER SNAKES.

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THE variation which occurs in the toxicity of the venom of individual snakes belonging to the same species has not yet been explained satisfactorily. The existence of this variation makes it necessary that the pooled venom of a large number of snakes be used whenever the neutralizing power of antivenene is being determined (Grasset, 1957).

It has been observed previously (Wiener, 1957, 1959) that amongst one species of venomous spiders the venom of the male spider is considerably more toxic to laboratory animals than the venom of the female spider. Since no similar comparison appears to have been made in the case of snakes, it was decided to determine whether or not the sex of the snake influences the toxicity of its venom. At the same time the venom yields in the two sexes were compared.

Materials and Methods.

Live tiger snakes, which had been collected in the Werribee Plains of Victoria during the month of October, were used several days after capture.

Venom was obtained from 12 snakes by inducing each snake to bite through a thin sheet of rubber stretched over a glass container. After 10 to 15 seconds, when no further venom was seen to flow down the sides of the container, the skin over the venom glands of the snake was massaged to express a further amount of venom. Both lots of venom, which will be referred to as milked venom, were collected from each snake in a separate labelled container, and a tag with the same number was tied around the neck of the snake. The snakes were then killed with chloroform. The venom glands of each snake were dissected and the viscous contents of the isolated venom glands collected in separate watch glasses to obtain the residual venom. Both the milked venom and the residual venom were dried over phosphorus pentoxide.

Sex of Snakes.

In order to determine the sex of the snake, an incision was made from the anal opening extending caudally. In a male snake, two tubular structures could then be seen extending to the tip of the tail. Each of these tubes contained one penis, which could be everted. It was later found that no incision was necessary, since pressure alone was sufficient to evert the penises of a dead snake. This could not be accomplished in the living snake. The lower part of the abdomen of the snake was also opened. In a female snake ovaries or numerous cigar-shaped ova could be seen.

Toxicity Assay.

The toxicity of the milked and residual venom of each snake was ossayed in male mice weighing 15 to 20 grammes. Groups of 21 mice were used for each assay.

The venom was dissolved in normal saline solution, and amounts ranging from 0·0002 to 0·006 mg. were injected in a volume of 0·5 ml. by the intraperitoneal route. Three mice were used for each concentration of venom. In some of the determinations which were made on residual venom the assay had to be repeated, since the LD_{50} dose was greater than 0·006 mg. In these cases the amounts of venom injected in the final assay ranged from 0·01 to 0·08 mg.

All animals were observed for a period of seven days, and any deaths which occurred were recorded. The LD_{50} dose of venom was calculated by a method described by Reed and Muench (1938).

Results.

The weights of the dried venom obtained by milking and those of the residual venom for each snake are shown in Table I. The total venom yields obtained from each snake in the two sexes ranged from 2·1 to 53·9 mg.

When the amount of venom was related to the length of the snake from which it was obtained, it was found that male snakes yielded significantly more venom than female snakes ($P < 0.05$). The total venom yield was also related to the volume of each snake, on the assumption that volume is proportional to the cube of the length. By this method it was again found that the venom yield of male snakes was significantly greater than that of female snakes.

The LD_{50} doses of both the milked venom and the residual venom of each snake are also shown in Table I. There was no significant difference in the toxicity of the venom of male and female snakes (Table II). However, in both sexes the toxicity of the residual venom was significantly lower than that of the milked venom.

Discussion.

The tiger snakes used in this study were actively growing adult specimens, since these snakes in the district in which they had been collected attain a maximum length of 1200 cm. (Tanner, 1959). Along the Murray River, where food is more abundant, they may attain 1500 cm. or more in length.

The average venom yield of tiger snakes recorded previously, in one series of 20 snakes, was 36 mg. (Fairley and Splatt, 1929), whilst in a larger series, an average venom yield of 27·6 mg was obtained (Freeman, 1934). The highest individual venom yield of 189 mg. was obtained from a snake measuring 1500 cm. in length. In neither series were the venom yields related to the sex of the snake.

TABLE I.

Venom Yields and Toxicity of the Venoms of Male and Female Tiger-Snakes.

Sex of Snake.	Length of Snake. (Cm.)	Weight of Milked Venom (Mg.).	Weight of Residual Venom (Mg.).	Total Venom Yield. (Mg.).	LD_{50} (Mg.).	
					Milked Venom.	Residual Venom.
Male	75·0	1·5	1·6	3·1	0·00079	0·057
	77·5	13·2	5·4	18·6	0·00063	0·00079
	81·0	13·6	0·3	13·9	0·00050	0·004
	81·0	11·4	6·5	17·9	0·0017	0·00063
	90·0	51·7	2·2	53·9	0·00063	0·00063
	92·5	30·2	0·2	30·4	0·00050	0·0028
	97·5	20·8	0·9	21·7	0·00050	0·028
Average[2] ..	—	20·3	2·4	22·79	0·00075	0·0134
Female	70·0	2·1	0	2·1	0·0012	—
	71·0	3·8	1·8	5·6	0·0020	0·024
	75·0	5·3	0·7	6·0	0·00074	0·0065
	77·5	10·6	1·1	11·1	0·00079	0·0028
	80·0	9·0	0·8	9·8	0·00050	0·014
Average[2] ..	—	6·0	0·9	6·92	0·00105	0·0118

[1] Present address, Prince Henry's Hospital, Melbourne.
[2] Arithmetic mean.

TABLE II.

Toxicity of Milked and Residual Venom of Male and Female Tiger-Snakes.

Sex of Snake and Type of Venom.	Number per Group.	Geometric Mean (LD_{50} in Mg.).	Log. Geometric Mean × 10^4.	Standard Error Log. Geometric Mean.	Difference.	Degree of Significance.
Male, milked (M)	7	0·00068	0·834	0·071	F−M = 0·135	Not significant.
Male, residual (MR) ..	7	0·0065	1·557	0·30	MR−M = 0·723	$P = 0·05$
Female, milked (F) ..	5	0·00093	0·969	0·10	FR−F = 0·970	$P < 0·01$
Female, residual (FR) ..	4	0·0087	1·939	0·20	FR−MR = 0·382	Not significant.

Klauber (1956), who has recorded the venom yields of different species of rattlesnakes, reported that in four out of six species of snakes the venom yields in the two sexes were the same; in one species there may have been a male superiority in venom yield, whilst in another species more venom was yielded by female than by male snakes. However, a strict comparison of the venom yields in the two sexes was complicated by the fact that in most species of rattlesnakes, males eventually reach a larger size than female snakes, and thus "one may have been comparing fully adult females with vigorous and still growing young males" (Klauber, 1956).

It is not known whether male tiger snakes eventually reach a larger size than female snakes, although the measurements made on the small number of snakes used in this study suggest it. Whatever the relative lengths ultimately attained in the two sexes may be, our results indicate that in tiger snakes measuring 70 to 97 cm. in length, the male snake yields significantly more venom per unit length than the female snake.

In the case of the funnel-web spider, the greater venom yield of the female spider was associated with a venom which was appreciably less toxic than that of the male spider (Wiener, 1959). No significant difference in the toxicity of the venom of the two sexes was demonstrable amongst tiger snakes. In fact, the variations in the toxicity of the venom of individual tiger snakes of the same sex were greater than those which occurred between the mean toxicity of the venom of the male and female group. Thus, other factors than those due to a difference in sex are responsible for the variation which occurs in the toxicity of the venom of different snakes belonging to the same species.

Fairley and Splatt (1929) found that when tiger snakes had been permitted to bite naturally, a further yield of venom, which constituted on the average 27% of the total venom, could be obtained by digital massage of the venom glands.[1] Since these authors did not dissect the venom glands, their estimate of the residual venom did not include the amount of venom which was still present in the glands after massage. In our series, this amount of venom constituted, on the average, 11% and 13% of the total venom which could be obtained from male and female snakes respectively.

Bücherl (1953) has observed differences in the physical characteristics and toxicity of successive fractions of venom obtained from two species of Brazilian scorpions. The first drops of venom consisted of a clear liquid which was appreciably less toxic than subsequent drops of venom, the appearance of which was opalescent. The last drops of venom, which were milky in appearance and more cellular, had the greatest toxicity.

In the case of the tiger snake, the toxicity of a mixture of naturally expelled venom and venom obtained by massage was significantly greater than that of the more cellular residual venom left in the venom glands. By adding their weight to the mass of dried venom, the presence of large numbers of cells, which alone are presumably non-toxic, could have produced this result. If this is the case, it may be inferred that, unlike the case of scorpions, whose venom apparently is secreted by holocrine glands in which the secretory cells and their products constitute the active venom, the secretory products of tiger snakes are liberated by apocrine glands, in which the secretory cells remain *in situ* and discharge their contents into the lumen of the gland. However, other cells with non-toxic properties may also occur in tiger-snake venom.

[1] Occasionally as much as 80% of the venom was held in reserve.

Summary.

The toxicity of the venom and the venom yields have been determined in seven male and five female tiger snakes.

There was no significant difference in the toxicity of the venom of male and female snakes.

The venom yields of male snakes were significantly greater than those of female snakes of comparable length.

Venom expelled after a natural bite and digital massage of the venom glands was more toxic than the residual venom expressed from the dissected venom glands.

Acknowledgements.

The valuable assistance of Mr. C. Tanner, who has supplied the snakes used in this study and collected venom from them, is gratefully acknowledged. I am also indebted to Dr. J. J. Graydon for having carried out the statistical analysis of the results obtained in this investigation.

References.

BÜCHERL, W. (1953), *"Escorpioes e escorpionismo. II. Atividade das peconhas de Tityus Serrulatus e T. Bahiensis sobre Camundongos", Mem. Inst. Butantan*, 25: 83.

FAIRLEY, N. H., and SPLATT, B. (1929), "Venom Yields in Australian Poisonous Snakes", MED. J. AUST., 1: 336.

FREEMAN, M. (1934), "The Venom Yields of Common Australian Snakes in Captivity", MED. J. AUST., 2: 373.

GRASSET, E. (1957), "Survey of Assay Methods of Antivenins", *Bull. Wld. Hlth. Org.*, 16: 79.

KLAUBER, L. M. (1956), "Rattlesnakes. Their Habits, Life Histories and Influence on Mankind", Univ. California Press, 2: 779.

REED, L. J., and MUENCH, H. (1938), "A Simple Method of Estimating Fifty Per Cent Endpoints", *Amer. J. Hyg.*, 27: 493.

TANNER, C. (1960), personal communication.

WIENER, S. (1957), "The Sydney Funnel-Web Spider (Atrax Robustus): I. Collection of Venom and its Toxicity in Animals", MED. J. AUST., 2: 377.

WIENER, S. (1959), "The Sydney Funnel-Web Spider (Atrax Robustus): II. Venom Yield and Other Characteristics of Spider in Captivity", MED. J. AUST., 2: 679.

NOTES ON THE USE OF "LIBRIUM" IN THE TREATMENT OF ALCOHOLISM.

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I SHOULD like to report on my work with a new compound "Ro.5-0690" ("Librium", Roche), particularly in assisting the alcoholic patient. At last I think we have something positive and well worth trying.

On taking the alcoholic's history, there seems to be one constant factor: all these patients complain of tension, and they all tell me that this tension at times becomes so great that alcohol is the only thing they know that will ease it, and soon they agree they are

caught in a vicious circle. This, I believe, is more than just a contributing factor in producing the true alcoholic. Whatever theories we may have relating to the build-up of this tension, it is the one common factor admitted by all alcoholics.

We have been partially successful with some very good mild tranquillizers in assisting the patients to control this tension; but the object of this paper is to discuss the product referred to above, and the help it has given to the patients who have passed through my hands.

The patients selected for this therapy have been of two types: (i) true alcoholics, whose life depends solely and wholly on alcohol, and who have developed the mental state in which alcohol is the only thing that they know will ease this mental tension; (ii) alcoholics in whom there is a neurotic element, such as an obsessional or anxiety state, in which alcohol is a large contributing factor.

The number of patients that I have used this substance on circulated so rapidly that I decided to observe its clinical effects as shown to me, rather than to conduct a series of tests, as may be possible with a reasonably stationary number of patients.

Each patient was started on a dose of 25 mg. twice a day.

The most significant constant finding was that the majority of patients reported a complete feeling of relaxation quite soon after the administration of "Librium". This was a matter of ten to fifteen minutes. This feeling of relaxation was felt mainly in the musculature of the body, and with it developed a sense of well-being and confidence, and they became very conscious of this ease in mental tension. (A few complained of feeling drowsy.) They felt they could go about their ordinary day's activities without the thought of drinking, which previously was for ever in their minds. It did not take away the compulsive thoughts of drink, but it certainly minimized their intensity.

This was the first reaction. It occurred within three days of therapy, and continued while they were taking the treatment. I believe that if there is no real response in three days, no response will occur at all.

When my patients become out-patients, they are instructed to report at regular intervals, and sometimes they do not appear. However, those who on their discharge are taking "Librium" have been most regular. They repeat the story that while taking it their state of tension is less dominating and they think less and less of alcohol. (I have studied the literature on this product, and I cannot find any reference to addiction. From its chemical formula I believe this is because it should be quickly metabolized.)

To me, the most sudden striking results have been in those patients suffering from an obsessional or anxiety state in whom alcohol has coloured the picture to such an extent that it is the dominant factor. There are many of these patients. Once again tension predominates and is increased in times of stress because of their neurosis.

These patients were typically suitable for out-patient treatment, and received the same doses as in-patients—25 mg. twice a day. They all reported alleviation of anxiety and tension, increased awareness of their responsibilities, and more ability and patience to deal with them. They all reported loss of compulsion for alcohol. In several cases, those who reported drinking while taking the treatment, only partially finished their drink, and were clearly able to analyse the position and come to the conclusion that they could do without drink. (One patient suffered from a habit spasm—twitching—in the muscles of his shoulder, and it has disappeared during the course of his treatment with "Librium". He had suffered from this for many years, and had a large degree of inferiority complex.)

The large majority of patients reported that the response was prompt. Some reported a feeling of return of their symptoms prior to their next dose. This makes me believe that careful constant manipulation of the dosage must be kept in mind. I have been guided by this in prescribing, and have come to the conclusion that they require three doses during the day (either 10 or 25 mg.). The patients, after several days' treatment, became more accessible to psychotherapy and seemed to benefit from this form of treatment. They all reported improved appetite and better relationships at home and at work, and they had greater control over their compulsiveness. Their feelings were less intense and their reactions more positive.

Of the side effects, ataxia has been mentioned. I have not yet observed this, nor does it seem to produce any extrapyramidal complications. The following are two cases which will illustrate its ability to bring about conscious relaxation and definite alleviation of tension.

One patient used to fear that he would die before he got home from work, and bought a bicycle to facilitate and speed his journey home. He would pedal furiously until he reached his home, and would then lock himself in the house near the telephone until the other members of the family came home. He was fearful of walking anywhere in case a sudden thunder storm occurred and he would be struck by lightning. On the third day of treatment he volunteered to go the messages for the other patients, which he did quite well on foot. He has been into Sydney several times to attend to business matters, and tells me that this fear that he had is fast diminishing, and although at times he is conscious of it, he can control it. Although he has lived in Sydney all his life, he has been away from it for so long because of these obsessions that he has had to find it again.

The second patient lived out of Parramatta, and had not been outside her home for twelve months, with rare exceptions. She had spent a large proportion of this period drinking, ending up with methylated spirits, as a result of which she had become paranoid. She was hallucinated at the first examination, but would not admit taking alcohol. It was impossible to have any discussion on the question with her. She refused admission to the hospital. We decided to try her on "Librium" at home for three days, and her husband said that he would watch her constantly for that period. She reported quite willingly in three days, and was a completely changed woman. She admitted that on the Friday she had been hearing voices, but once again the story was the same, that from the very first dose she was conscious of this muscular relaxation and loss of mental tension. It has seemed to assist her to coordinate her mental processes without the constant overload of conscious tension.

Conclusion.

I feel that from the limited trial I have given this product, it will be of great value to me in the treatment of alcoholics, especially in out-patient treatment, and most particularly in cases complicated by neurosis.

Acknowledgement.

I should like to express my thanks to Roche Laboratories for supplying me with "Librium" for this trial.

Reviews.

Alfred Hospital Clinical Reports. Edited by R. S. Lawson, Volume 9, 1959. Melbourne: Alfred Hospital. 10" x 5½", pp. 134, with illustrations. Price not stated.

THE current volume of *Alfred Hospital Clinical Reports* lives up to the standard of its predecessors both in the quality of its reading matter and in the excellence of its production. Its opening chapter on the history of thoracic surgery by C. J. Officer Brown is a brief and very readable sketch of the subject from Hippocrates to the present day. In the third chapter Robin Williams discusses a series of 500 consecutive cases of acute appendicitis, and reviews all fatal cases recorded at the hospital in the 10 years from 1948 to 1957. In a total of 5310 cases of acute appendicitis there were 30 deaths, a mortality rate of 0·56%; this figure compares favourably with other recently published major series. In another chapter Williams contributes a review of patients admitted to the Alfred Hospital in 1958 with fractures of the femoral neck.

The most substantial single contribution is a review by A. J. Barnett of 27 cases characterized by the occurrence of both scleroderma and Raynaud's phenomenon. Barnett proposes a classification of this subgroup according to whether scleroderma is confined to the fingers or is more widespread, and whether the digital ischæmia should be regarded as Raynaud's disease or Raynaud's phenomenon. In distinguishing between these two conditions, Barnett adopts as his criterion the fact that Raynaud's disease occurs primarily in women and has its onset usually before the age of 40 years; he then rejects all cases occurring in men or with onset after the age of 40 years as examples of Raynaud's disease, and classifies them as cases of Raynaud's phenomenon. Whatever the validity of this method of classification, it is evidently convenient, and the article as a whole is a useful and informative discussion of a most obscure condition.

Other articles are one on the pathology of cerebro-vascular accidents by R. McD. Anderson, a well-illustrated account of the surgery of atrial septal defects by G. R. Stirling (the atrial well technique is favoured in most cases), a report on 30 cases of mesenteric vascular occlusion by I. H. Ogilvy, a report of a curious case of double gall-bladder by R. M. Feldman, and a short account by J. K. Francis and A. J. Barnett of an investigation of Troensgaard-Hansen's claims that amnion implantation abolishes or greatly relieves intermittent claudication; Francis and Barnett tried the operation on 21 patients, but found that, though transient improvement occurred in a few, this was not maintained, and there was no evidence that amnion implantation has any specific value in the treatment of intermittent claudication from occlusive arterial disease.

Pressure Group Politics: The Case of the British Medical Association. By H. Eckstein; 1960. London: George Allen and Unwin Ltd. 8¾" × 5¾", pp. 168. Price: 16s. (English).

PRIMARILY designed as a general study of pressure-group politics, this book is in fact mainly taken up with an examination of the British Medical Association as a particular example of the general subject. The study as a whole will no doubt appeal to the student of political theory. The general reader with a taste for these things will also find it interesting, if a trifle tedious at times, especially if he can manage either to get used to or to ignore the distracting footnotes which appear on nearly ever page. The picture that is drawn of the British Medical Association concerns all who are interested in medical politics, but it differs greatly from that which applies in Australia. Indeed, the book brings home in a very striking manner just how widely divergent are the patterns of medical practice and national health services in the United Kingdom and in Australia.

Antibiotics Annual 1959-1960; Seventh Annual Symposium on Antibiotics. Edited by Henry Welch, Ph.D. and Felix Marti-Ibanez; 1960. New York: Antibiotics, Inc. and Interscience Publishers, Inc. 10" × 6¾", pp. 1054 with illustrations. Price: $15.00.

THE annual symposium on antibiotics, sponsored by *Antibiotics and Chemotherapy* and *Antibiotic Medicine and Clinical Therapy*, has by now become firmly established as an occasion of international importance for the presentation of the latest advances in antibiotic pharmacology and therapeutics, and for discussions of the current problems in the whole field of antibiotics and chemotherapy. The present volume contains the proceedings of the seventh of these symposiums, held in November, 1959, and has been published with commendable promptitude. It consists of 150 papers, selected from nearly twice that number submitted from all over the world. Of these 150, only a limited selection were read at the symposium, but all are printed in full in this volume. The programme included two panel sessions, one on the problems of human sensitization to antibiotics, the other on the treatment of acute and chronic infections in pædiatrics and geriatrics; both these are reported in full.

Together, this collection of papers presents a very complete survey of the present position in the field of antibiotic medicine, including both research into the properties and nature of the drugs and studies in their therapeutic application. Reports are presented on six new entrants in the field since the last symposium; these are colistin, aspartocin, fervenulin, streptozotocin and rifomycin. Of these, colistin, a Japanese discovery, is stated to stand out as the one sufficiently studied and of sufficient promise to be ready for more extensive trial. Of previously reported agents, new uses are described for paromomycin, which is stated to be effective in amœbic dysentery, and for amphotericin. Griseofulvin is acclaimed as the outstanding antifungal agent in superficial infections. Reports on antitumour agents include two new ones, streptonigrin and diazomycin. In the same field, further studies are presented on actinobolin and streptovitacin, as well as a report of extensive clinical trials with mitomycin C in Japan. A report is included of experience with cyclophosphamide, a non-antibiotic antitumour agent, in the treatment of 10 cases of childhood tumours; striking remissions were obtained in four of these.

The many papers on the more familiar groups of antibiotics include reports of two new tetracycline compounds, demethylchlortetracycline and pyrrolidinomethyl tetracycline; the former appears to be as effective as the established tetracyclines, but in much smaller doses, and the latter is suggested as particularly suitable for administration by injection. Finally, the work on the new synthetic penicillins is hailed by Henry Welch, chairman of the symposium, as one of the outstanding contributions of the year.

Myasthenia Gravis. By Kermit E. Osserman, M.D., F.A.C.P.; 1958. New York and London: Grune and Stratton, Incorporated. 9" × 5¾", pp. 296, with 58 illustrations, 24 tables. Price: $10.00.

MYASTHENIA GRAVIS was recognized by Thomas Willis almost 300 years ago, but effective treatment dates only from 1934, when Dr. Mary Walker reported her success with eserine. Since then an extensive literature has accumulated, and this monograph provides an excellent review of the basic scientific and practical aspects of this disease.

The pathological types of striated muscle lesions are well described and illustrated. The histopathological changes in the thymus gland of myasthenic patients are critically discussed, and evidence is given that not all patients with thymoma have myasthenia gravis. The pathophysiology of myasthenia is fully considered, and the different types of neuro-muscular block are explained. Competition block (inhibition of the depolarizing action of the transmitter on the muscle end plate), which is thought to be the basis of myasthenia, is contrasted with depolarization block, which results from overdosage with anticholinesterase compounds.

Clinical aspects of the disease are well illustrated and include an analysis of the incidence of various symptoms in the author's own series of 325 patients. Pharmaceutical and mechanical tests to confirm the diagnosis are described. The intravenous injection of "Tensilon" proved to be the most useful guide both to diagnosis and to adjustment of dosage of anticholinesterase drugs. The general management of the myasthenic patient, of crisis and of other complications, is well covered. The detailed and practical description of specific drug treatment is most valuable, although some preparations, such as "Mytelase" and "Time-span Prostigmin", are not yet available in this country. The danger of cholinergic reactions due to over-dosage of drugs is emphasized.

The problem of thymectomy is critically evaluated. While the scientific basis for this operation is still the subject of argument, there is ample clinical evidence that thymectomy is of value for selected patients, mainly young women with severe myasthenia of recent onset.

Chapters on radiotherapy to the thymus, nursing care, endocrinology, obstetric problems and myasthenia in childhood and an exhaustive bibliography complete a most valuable and comprehensive review.

This splendid book contains all the up-to-date knowledge on myasthenia gravis, and will be of interest and value to all physicians, neurologists, surgeons and anæsthetists concerned in the management of this disease.

Pathology of Infancy and Childhood. By Agnes R. Macgregor, M.D., F.R.C.P.E., F.R.C.O.G.; 1960. Edinburgh and London: E. & S. Livingstone Ltd. 8¼" × 5¼", pp. 640, with many illustrations. Price: 75s. net (English).

THIS is a relatively small volume in which to encompass the entire field of tissue pathology in the neonate, the infant and the child. It is of necessity, therefore, a textbook, in which most pathological states receive mention, but nothing is considered at length; and careful restraint has been exercised to avoid undue emphasis on topics which may have been of special personal interest to the author.

As is indicated in the preface, this book is designed principally for the undergraduate and for the graduate reading for a higher diploma, and to a lesser extent for the pathologist who handles pædiatric material but rarely. It should fulfil its purpose admirably, though for the latter purpose

its value would be enhanced by a much wider list of references. The factual content will have little appeal to the experienced pædiatric pathologist; but having sampled the contents he may well feel inclined to purchase a copy as an example of clarity and simplicity of expression.

The material is divided into nine parts. Three of these—the pathology of the fœtal and neonatal period, developmental malformations and infective diseases—occupy just over half the volume. The remaining six parts are of varying length, and the section on diseases of the blood is quite short. This section, and the concluding one on miscellaneous diseases, seem to lack, probably because of their brevity, the confident touch of long experience evident elsewhere in these pages, and as a result the short discussion on diseases of muscle, for example, does nothing to clarify a still somewhat confused subject.

The illustrations, of which 20 are excellent colour reproductions, are plentiful, well chosen and with few exceptions of good detail, and show what is indicated by the text, though this is not true of Figure 218.

There is a strong conservative tone throughout, with what seems a conscious effort to refrain from expressing opinions. This leaves us feeling a little let down at times; however, like practically all the criticisms which can be levelled at this book, this is related to the fact that it is a text-book and not a monograph on a selected subject.

Deafness: A Comprehensive Account of Deafness as it Affects People of all Ages. By J. Chalmers Ballantyne, F.R.C.S., D.L.O.; 1960. London: J. and A. Churchill Ltd. 8" × 5¼", pp 264, with 71 illustrations. Price: 25s.

THIS is a remarkable little book, in that in a small and very conveniently arranged form the reader has a comprehensive treatment of a subject which is of wide interest and some complexity.

This book is not written solely for medical practitioners, but is aimed also at informing lay workers, such as teachers of the deaf, educational psychologists and others, whose work demands that they should have a wide, though not necessarily profound, understanding of this subject. It could also be a very valuable source of information for general practitioners and pædiatricians. By the ear, nose and throat specialist it can be read with profit, as the author has had an unusually wide experience in this field, and presents familiar material with a freshness and clarity which make very pleasant and profitable reading. The sections on the technical aspects of the subject, such as anatomy, physiology and acoustics, are models of lucid explanation, and could well be a lesson to writers of more comprehensive and formal textbooks.

The diagrams and illustrations are not particularly ornate, but are accurate and sufficiently informative. Controversial subjects are dealt with fairly, and with commendable conservatism.

It may be a little disappointing that, in a book dated 1960, the subject of surgery of otosclerosis is concluded abruptly with a description of stapes mobilization, without any mention of the new horizons constantly being opened in this subject by more advanced techniques. The reader outside Great Britain may find the repeated and frequent references to British practice rather irksome; but these references are in fact modest and inevitable evidence of the leadership of that country in the care of the deaf over the past century.

Bone as a Tissue. Edited by Kaare Rodahl, M.D., Jesse T. Nicholson, M.D., and Ernest M. Brown, Jr., M.D.; 1960. New York, Toronto and London: McGraw-Hill Book Company, Inc. 9" × 5¾", pp. 368 with many illustrations. Price: Not stated.

THE proceedings of an international conference on "Bone as a Tissue", held at Lankenau Hospital, Philadelphia, in October, 1958, are presented in four sections: osteoporosis; dynamics of calcium metabolism; ultrastructure of bone; vitamin D, parathyroids, citric acid, calcium and phosphorus.

A feature of the book, ensuring its value to the critical clinician, is the number of papers by clinicians engaged in research work—papers not only on autoradiography and the still unsolved ætiology of osteoporosis, but also on the structure and metabolism of bone and the physical chemistry of its calcification. For the full-time research worker the book provides an excellent review of recent work up to the end of 1958, particularly on the dynamics of calcium metabolism and the ultrastructure of bone.

Although verbatim reports of the discussions at such symposia ensure the accuracy of their publication, a pruning and editing of the remarks would make them much more useful to readers. This is a general criticism that is not directed in particular at "Bone as a Tissue"; in fact, apart from the foregoing criticism, the discussions reported in this book are particularly noteworthy and the organizers of the conference are to be congratulated on the quality of the whole proceedings.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"The Annual of Czechoslovak Medical Literature, 1957", by Státní Lékarská Knihovna (National Medical Library); 1959. Praha: Státní Zdravotnické Nakladatelstvi. 8¼" × 5½", pp. 594. Price: not stated.

"Ciba Foundation Symposium on Congenital Malformations", edited by G. E. W. Wolstenholme, O.B.E., M.A., M.B., M.R.C.P., and Cecilia M. O'Connor, B.Sc.; 1960. London: J. & A. Churchill Ltd. 8" × 5", pp. 320, with 91 illustrations. Price: 45s. (English).

"Biochemistry for Medical Students", by William Veale Thorpe, M.A. (Cantab.), Ph.D. (Lond.); seventh edition, 1960. London: J. & A. Churchill Ltd. 8" × 5", pp. 560, with 50 illustrations. Price: 30s. net (English).

"Ciba Foundation Symposium on Cellular Aspects of Immunity", edited by G. E. W. Wolstenholme, O.B.E., M.A., M.B., M.R.C.P., and Maeve O'Connor, B.A.; 1960. London: J. & A. Churchill Ltd. 8" × 5¼", pp. 508, with 117 illustrations. Price: 60s. net (English).

"Endemic Goitre", by F. W. Clements *et alii*; World Health Organization Monograph Series, No. 44; 1960. Geneva: World Health Organization. 9½" × 6", pp. 472, with illustrations. Price: £2.

"Joint FAO/WHO Expert Committee on Milk Hygiene", World Health Organization, Technical Report Series, No. 197; 1960. Geneva: World Health Organization, and Food and Agriculture Organization. 9¼" × 6¼", pp. 55. Price: 3s. 6d.

"Neurochemistry of Epilepsy: Seizure Mechanisms and Their Management", by Donald B. Tower, M.D., Ph.D.; 1960. Oxford: Blackwell Scientific Publications Ltd. Springfield: Charles C. Thomas. 8½" × 5½", pp. 337. Price: 72s.

"Controlled Clinical Trials: Papers Delivered at the Conference Convened by The Council for International Organizations of Medical Sciences Established under the Joint Auspices of UNESCO and WHO", organized under the direction of A. Bradford Hill, F.R.S.; 1960. Oxford: Blackwell Scientific Publications Ltd. 9" × 5¾", pp. 184, with illustrations. Price: 20s.

"The Chemical Senses in Health and Disease", by H. Kalmus, Sc.D., M.D., and S. J. Hubbard, B.Sc., Ph.D.; 1960. Oxford: Blackwell Scientific Publications Ltd. Springfield: Charles C. Thomas. 9" × 5¾", pp. 102, with illustrations. Price: 30s.

"Neurology", by Roy R. Grinker, Paul C. Bucy, M.D., and Adolph L. Sahs, M.D.; fifth edition; 1960. Oxford: Blackwell Scientific Publications Ltd. 9¾" × 6¼", pp. 1398, with 495 illustrations. Price: £9 16s.

"Handbook for School Medical Officers", edited by H. I. Robinson, M.D.; 1960. Victoria: School Medical Service Department of Health. 8½" × 5½", pp. 144. Price: 10s.

"Babies by Choice or by Chance", by Alan F. Guttmacher and Eleanor Mears; 1960. London: Victor Gollancz Ltd. 7¾" × 5", pp. 192. Price: 12s. 6d.

"Experiments and Observations on the Gastric Juice and the Physiology of Digestion", by William Beaumont, M.D.; 1960. New York: Dover Publications Inc. 8" × 5½", pp. 330. Price: $1.50.

"Source Book of Medical History", compiled with notes by Logan Clendening; 1960. New York: Dover Publications. 8" × 5", pp. 700. Price: $2.75.

"How to Cook for an Ulcer", by Eileen Keane; 1960. Sydney: Angus and Robertson Ltd. 7¾" × 5¼", pp. 46. Price: 7s. 6d.

"Blood Flow in Arteries", by D. A. McDonald, M.A., D.M. (Oxon.), D.Sc. (Lond.); Monographs of the Physiological Society, Number 7; 1960. London: Edward Arnold (Publishers) Ltd. 8½" × 5½", pp. 338, with illustrations. Price: 40s. net (English).

"Classics of Medicine and Surgery", collected by C. N. B. Camac; 1960. New York: Dover Publications Inc. 8" × 5½", pp. 436. Price: $2.25.

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RESEARCH IN GENERAL PRACTICE.

"RESEARCH, the real thing, means adding in however small degree to the sum of human knowledge. How are we general practitioners placed for that?" The statement and the question are worth consideration as they stand, but even more because they come from an English general practitioner, R. E. Hope Simpson,[1] who combines a large general practice with the care of an epidemic research unit of the Medical Research Council in Cirencester and has to his credit a number of worthwhile publications in the field of general practitioner research. He dismisses with scorn the "sort of meretricious case-mathematics that too often slide by under the flag of research" and rightly suggests that general practitioners have not been notable offenders in that sort of thing. However, as he points out, the opportunities for research are enormous in general practice.

> Human departures from normality are our business. The populations under our care are representative samples, respectable universes even for those gentlemen so difficult to please, the statisticians. We remain for years right inside our field of observation. Even the commonest diseases hold many and important problems.

What then hinders the general practitioner from engaging in research work? From first hand and no doubt sometimes bitter experience Hope Simpson lists the main difficulties and pitfalls. The first is lack of consecutive time and interruptions, with the ever-present factor of fatigue, added to the discouragement inherent in all research work, which is "seldom a matter of brief investigation with rich rewards". The second is "the very plethora of material and the way in which it reaches us"; practice goes on without respect for research, and recording or investigating of epidemics or current series of cases can be pushed aside by more pressing activities, never to be resumed or completed. The third pitfall is one of diagnosis, which for many reasons is not always as precise as could be wished for practical purposes or as is necessary for research; although there is the compensating corollary that research makes the general practitioner a keener clinician. A fourth pitfall, Hope Simpson suggests, lies in medical training, which does not always ensure a critical outlook. Indeed, it is sometimes inevitable and probably desirable that the general practitioner (and sometimes, we may add, his more highly placed specialist colleagues) should display a confidence in his diagnosis that he may not feel at the time, and that he should prescribe boldly even if somewhat empirically; in some quite legitimate circumstances there is full justification for the principle of Hope Simpson's *bon mot*: "Suspension of chloramphenicol [even if the rationale of its prescription is in doubt] offers certain advantages over suspension of judgement." This is not for a moment necessarily a matter of suspension of honesty. It is part of the business of doing the best for the patient in the light of experience and clinical wisdom, and it can involve the practitioner in a "deliberate partial suspension of the critical faculty in the immediate practice of medicine". For the research worker, on the other hand, this sort of thing is unthinkable. He must assume a thing to be false until proven, must be suspicious of authority and seek out its errors. Therefore, Hope Simpson states, the general-practitioner research worker must be schizoid. "As general practitioner he must be an authoritarian, as research worker he must be a sceptic."

We shall not now follow Hope Simpson into his further examination of how the general practitioner may go about his research, though what he has to say is well worth the attention of those interested. Perhaps we have said enough to stimulate the general practitioner into rethinking this subject of research and accepting its challenge, fully aware of but not bluffed by its difficulties. Plenty of encouragement is to be found in current general practitioner activity. Indeed, research is a major and highly commendable part of the programme of the Australian College of General Practitioners, as it is of the parent College of Great Britain. The part which the parent College is playing in this field has been admirably summarized by the chairman of the Council Research Committee of the Australian College of General Practitioners, John G. Radford,[2] in a paper which warrants study. In Australia the subject is claiming a good deal of attention under the stimulus of the committee of which Dr. Radford is chairman and also of research committees within State Faculties of the College. The emphasis has been wisely placed on group investigations, and already useful collective work has been done on eclampsia, penicillin reactions, staphylococcal infections, anæmia and other subjects. However, as Clifford Jungfer[3] pointed out last year, general practitioners interested in research can be classified into three groups: (i) the lone worker, who pursues a particular investigation within his own practice; (ii) the practitioner who will observe and record, leaving others to analyse the material and formulate conclusions; (iii) the participant in a wider class of investigation involving a number of practices and requiring a team for its purposes. The College will seek to encourage each of these. Dr. Jungfer also drew attention to the value of general practitioner research in helping general practice to take a worthy place alongside other groups in Australian medicine and so encouraging the very necessary unity of our profession. Rightly conceived, research, as Dr. Jungfer has said, should be regarded not as the privilege of the few, but as the duty of the many. It is not to be expected that much of a spectacular nature will come out

[1] *J. Coll. gen. Practit.*, 1958, 1: 225 (August).

[2] *Bull. post-grad. Comm. Med. Univ. Sydney*, 1960, 16: 79 (June).

[3] MED. J. AUST., 1959, 2: 585 (October 24).

of run-of-the-mill general practitioner research, but the prospect has a certain fascination and only good can come of it. It will, amongst other things, help to encourage further what has been described as the renaissance of general practice in our day. The policy of the Australian College of General Practitioners of actively stimulating and guiding general practitioner research is much to be commended.

Current Comment.

HEALTH IN THE CONGO.

EMERGENCY ACTION is being taken on the health side of the United Nations operation in the Congo, in order to avert the possible consequences of the breakdown of preventive health services in many parts of the country, according to a statement issued recently by the World Health Organization. The immediate target is to recruit 100 medical and highly skilled technical staff, principally to reactivate the preventive health services designed to stop the spread of communicable diseases. Subsequently it is hoped to recruit another 300 to 400 medical and technical personnel before the end of the year.

In reporting on the deteriorating situation to the United Nations and to WHO headquarters in Geneva, Dr. J. S. McKenzie Pollock, Senior WHO Representative in the Congo, warned that the momentum of the past was slowing down, and that the effects of the discontinuation of preventive measures could be seen. In the course of one recent week, four separate outbreaks of smallpox were reported and at present the public health services of the country are not in a position to combat any epidemic. Stocks of vaccine are available, thanks to the generosity of the Nigerian Government, but the technical skill necessary to organize a large-scale vaccination programme is lacking, and such a programme can be started only when technical staff from outside is available. The threat is not confined to smallpox. In the Bunia area, for instance, an outbreak of bubonic plague is being investigated. Its extent is not known, but some deaths have occurred. In addition, reports are being received of an increasing number of cases of malaria, and Dr. McKenzie Pollock has issued the warning that, if preventive measures are not restarted, an increase in the incidence of sleeping sickness can also be expected.

The WHO advisory team to the Central Ministry of Health has drawn up a list of doctors and senior technicians needed to reactivate the public health services of the Congo.

Until now, Red Cross and Red Crescent personnel, as well as medical teams sent by governments, have manned the hospital services of the Congo. Most of them came for three months, and in many instances most of this period has expired. At the peak they numbered nearly 160 qualified medical and technical personnel, divided into 33 teams and representing 22 countries. However, the U.S.S.R. team of 20 doctors and four interpreters, and the Israeli team of 8 doctors and 5 nurses and technicians, have been withdrawn. As an interim measure 5 further Red Cross teams are being called upon for service in the Congo, by the League of Red Cross Societies, at the request of WHO. This large scale recruitment drive for medical personnel is the first one of its kind to be launched by the United Nations Operation in the Congo. The medical personnel will be under contract to the Congolese Government, but enjoy the protection of the United Nations, and a salary guarantee until budgetary arrangements between the United Nations and the Congolese Government have been worked out. The recruitment services of the World Health Organization will be used for the drive and will, *inter alia*, ensure that adequate standards of technical competence are maintained.

SOME FACTS ABOUT FIBROCYSTIC DISEASE.

IN the report[1] of a recent survey by the United States Public Health Service Children's Bureau the conclusion is expressed that fibrocystic disease (cystic fibrosis) ranks higher as a cause of death in children than such well-known diseases as diabetes, rheumatic fever and poliomyelitis, and that it is also comparable to these diseases in the lasting disability it often causes in patients who survive. A leading article in a recent issue of *The Journal of the American Medical Association* comments[2]:

> Unknown until 25 years ago, cystic fibrosis of the pancreas is now thought to be one of the most common and one of the most serious chronic diseases of childhood.

In the same issue are published two articles by P. A. Di Sant' Agnese, who has played an important rôle in bringing our knowledge of fibrocystic disease to its present state. Few diseases have emerged from obscurity to a position of major importance in such a short time. The reasons for this are various. In the first place, before the condition became generally recognized, most patients with fibrocystic disease in the fully developed form died of bronchopneumonia in infancy or early childhood. For another thing, as knowledge of the disease progressed, it gathered in various entities, such as meconium ileus, whose ætiology had previously been unrecognized. Then, with the advent of antibiotic therapy and improved understanding of the condition, more of its victims have survived into later childhood and even to adult life. Finally, with increasing accuracy of diagnosis of pulmonary and gastrointestinal conditions, it has been realized that the disease may be present in an incomplete form. Some patients in whom pancreatic symptoms predominated were previously grouped as subjects of cœliac disease, and in others the presenting symptoms are exclusively pulmonary; one group of German investigators has recently claimed that manifestations of restricted forms of fibrocystic disease are not uncommon in adults. Though some of the facts are still in debate, it is clear that fibrocystic disease has become a condition of very general importance. It is generally accepted that fibrocystic disease is an inherited condition, probably transmitted as a recessive trait. It is largely restricted to people of Caucasoid stock, being rare in Negroes, and it is said to be unknown in the Mongoloid races. In North America it occurs in about one in every 1000 live births, and estimates of the incidence of the gene in the population range as high as 20%. D. Y. Hsia has pointed out that as persons who are homozygous for fibrocystic disease have in the past usually died before reproducing, and as there is no evidence that the heterozygous state confers any advantage, it must be assumed that the persistence of the recessive gene in the population is due to an exceptionally high mutation rate. Clearly there is much more to be learned about this aspect of the matter. That fibrocystic disease of the pancreas still carries a high mortality rate is shown by Di Sant' Agnese's statement that of 550 patients with fibrocystic disease seen at the Babies' Hospital of New York during the last 20 years, more than 300 are dead, and only 106 have survived beyond the age of 10 years; more than 90% of the deaths were due to progressive chronic pulmonary disease. However, for those who reach adolescence the prognosis is very much better, probably partly because only those who were less severely affected survive. Di Sant' Agnese states that in these patients digestion and absorption of food seems to improve as they grow older. Though nearly all have pancreatic deficiency, most tolerate a virtually unrestricted diet and digestive symptoms are frequently minimal. In the article from which most of the foregoing facts are taken, Di Sant' Agnese and A. M. Vidaurreta[3] give an excellent general account of fibrocystic disease in the light of present knowledge, which is strongly recommended to anyone who has the opportunity to read it. It is noted that Di Sant' Agnese and Vidauretta make no

[1] *Publ. Hlth. Rep.* (*Wash.*), 1959, 74: 764 (September).
[2] *J. Amer. med. Ass.*, 1960, 172: 2084 (April 30).
[3] *Ibidem*, 172: 2065.

reference to the views put forward by G. B. S. Roberts[4] on the nature of the defect, on which we commented earlier this year,[5] but are content to state "the nature of this widespread disturbance of exocrine secretion is not known as yet". However, they do state that in the duodenum of most patients with fibrocystic disease, a mucoprotein has been found which is abnormal in its chemical structure and its physico-chemical properties, and suggest that such abnormalities of excretory products could explain the nature of the disease, thereby lending support to the "molecular" theory of the disease which is rejected by Roberts.

In a second article Di Sant' Agnese[6] draws attention to an important but little known aspect of the disease. Di Sant' Agnese was one of those who in 1953 established the fact that an elevated sodium and chloride content in the sweat of affected individuals is one of the most constant characteristics of fibrocystic disease, and the danger of acute salt depletion in affected children during hot weather is now well recognized. A report by W. A. C. Douglas[7] of such a case was published in this Journal some months ago. However, it is not generally realized that children, especially infants, with fibrocystic disease are also susceptible to salt depletion and dehydration in cool or even cold weather. Di Sant' Agnese reports five cases in which patients aged from four weeks to 16 months were admitted to hospital under such circumstances. In four of these five cases the diagnosis of fibrocystic disease had not been suspected before the patient's admission to hospital. None of these patients had suffered from diarrhœa as a precipitating factor, and vomiting was not excessive and was considered insufficient to explain the severe dehydration and electrolyte depletion which occurred. The mechanism was thought to be repeated small losses through sweat, and possibly gastric secretion as well, coupled with inadequate oral intake, which gradually led to negative salt balance over a period of time. Di Sant' Agnese emphasizes the importance of keeping cystic fibrosis in mind in the differential diagnosis of hypoelectrolytæmia and dehydration in infancy, especially when the clinical picture is not adequately explained by the amount of vomiting or diarrhœa. Two of these patients were referred from other hospitals with a tentative diagnosis of adrenal insufficiency, but it is pointed out that in this age group fibrocystic disease is at least as common a cause of electrolyte depletion and dehydration. Di Sant' Agnese suggests as a prophylactic measure that, as soon as the diagnosis of fibrocystic disease is suspected in an infant, additional sodium chloride should be given in the diet, even in cold weather, and that in such patients special attention should be paid to the electrolyte balance when even minor degrees of vomiting develop.

BRUXISM AND CHRONIC HEADACHE.

IN these columns in the issue of September 1, 1956, an account was given of investigations by R. Berlin, L. Dessner and S. Aberg on the relation between dysfunction of the temporo-mandibular joint and chronic headache. R. Berlin and L. Dessner[1] have continued this study, in particular as to the muscular origin of the headache, and have extended their studies to bruxism. They define bruxism as an habitual unconscious clenching or grinding of the teeth to no physiological purpose. This gradually results in permanent overstrain of the masticatory muscles. The patient is usually unaware of this habit. It is commonest during sleep but may be noticed during the day when the patient is concentrating on something or on some trying work. In a state of isometric or static activity the blood flow in the muscles is decreased, and the constant strain on the whole muscle, with little opportunity for rest and recovery, leads to exhaustion of the muscle fibrils. There is progressive ischæmia of the muscles. This leads to pain, felt mainly as headache. Berlin and Dessner point out that bite disturbances are common but are relatively seldom associated with bruxism. Some additional factor would seem to be necessary to produce bruxism, and this may well be psychological; this is supported by the fact that the condition is commonest in people who are under emotional tension.

The patient usually wakes with a headache and will often admit to tenderness in the teeth or masseter muscles. The lower jaw cannot be relaxed to the normal extent, and the free way space between upper and lower jaw is greatly reduced. The pain is usually felt as a dull pressing headache, situated towards the front. Sometimes it is unilateral. Sixty-two patients diagnosed as having this condition were studied. The most successful treatment depended on making it impossible for the patient to clench his teeth. This can be done with a special "relaxation" plate designed by L. Dessner. This involves the insertion of a bite plane between the upper and lower incisors thus increasing the intermaxillary space. The plate, made of acrylic resin, is worn on the upper jaw and is retained by a pair of simple clamps. As the jaws cannot be clenched, muscular strain cannot occur. The plate is worn regularly for at least six months. The headache generally disappears within four to six weeks. Of the 62 patients 42 were completely cured in one or two months, 12 were considerably improved and had headaches only occasionally, 6 were only slightly improved, and 2 were not improved. Controls in 7 cases with a "pseudoplate" which could not prevent the clenching showed no improvement. This condition, which appears to be of considerable practical importance, has been discussed a number of times by dentists, but medical men have paid relatively little attention to it.

SUPPRESSION OF PAIN BY SOUND.

IT has been said that music soothes the savage breast, but little virtue has been attributed to noise. Now, however, a group of dentists in Cambridge, Massachusetts, (W. J. Gardner, J. C. R. Licklider and A. Z. Weisz) have devised a method for suppressing pain which involves the use of both music and noise.[1] The music is to promote relaxation, the noise directly suppresses pain. In one of the dental offices the suppression of pain by sound has been found fully effective in 65% of 1000 patients who previously required nitrous oxide or a local anæsthetic for comparable operations. In only 10% was the reaction less than adequate. Eight other dentists have tried the method, and in 90% of 5000 operations sound stimulation has been the only analgesic agent required. One dentist extracted over 200 teeth without any difficulty or report of objectionable pain.

The patient wears headphones and controls the stimuli through a small control box held in the hands. He listens to music until pain is expected and then turns up the intensity of the noise stimulus. The only description of the kind of noise used or the apparatus which makes it is in a single sentence: "It is a random noise with a spectrum shaped by low-pass filters to provide a compromise between analgesic effectiveness and pleasantness of quality." During cavity preparation the noise masks the sound of the dental drill, thereby removing the source of conditioned anxiety. Certain suggestions as to the mechanism of the analgesic effect are given, but they do not seem adequate.

The method has been used for heart catheterizations, labour and childbirth, and removal of a polyp. It is stated to have been effective in over two-thirds of these applications. When it was not effective, the patient was not relaxed or the pain was well developed before the sound was turned on.

[4] *Lancet*, 1959, 2: 964 (November 28).
[5] MED. J. AUST., 1960, 1: 257 (February 13).
[6] *J. Amer. med. Ass.*, 1960, 2: 2014 (April 30).
[7] MED. J. AUST., 1959, 2: 962 (December 26).
[1] *Lancet*, 1960, 2: 289 (August 6).

[1] *Science*, 1960, 132: 32 (July 1).

Abstracts from Medical Literature.

PHYSIOLOGY.

Surface Ionic Changes and the Coagulation of Blood.

D. HUBBARD AND G. L. LUCAS (*J. appl. Physiol.*, March, 1960) report some observations on the physico-chemical role played by glass surfaces in accelerating the "normal" coagulation rate of blood, in light of the non-migratable negative ionic change which appears on leached glass surfaces and the orientation of the positively charged calcium ion of the blood at the fluid glass interface. Numerous other materials such as artificial arteries, heart valves, bandages, clays, tobacco, tea leaves, spider web, coffee grounds, and so on, as well as "live" skin, have been investigated with respect to the ionic nature of their surfaces and their effect on blood coagulation. An effort was made to establish the ionic charge of the endothelial layer of the circulatory system; however, the procedure used in this investigation does not lend itself to in-vivo or even convincingly to in-vitro determinations. The ionic nature of the material was determined from the uneven distribution of $Ag(NH_3)_2^+$ and B^- ions in full strength aqueous ammonia caused by the non-migratable ionic charge characteristics of the surfaces.

Lymphatics in Genesis of Ascites.

H. E. RAYBUCK, T. WEATHERFORD AND L. ALLEN (*Amer. J. Physiol.*, June, 1960) report that almost total obliteration of the peritoneal lymphatic drainage in rats produced no increase in peritoneal fluid. The problem was extended to observe the effect of peritoneal lymphatic obstruction with superimposed infrahepatic portal hypertension on peritoneal fluid dynamics. In control animals infrahepatic portal hypertension was produced by partial obstruction of the portal vein with an aluminium clip. In animals with peritoneal lymphatic obliteration and portal hypertension serous fluid accumulation was three times as great as in those with portal hypertension alone and resembled clinical ascites. Such findings indicate that subtotal peritoneal lymphatic obstruction alone does not appreciably affect serous fluid dynamics. However, in the presence of altered physiological mechanisms involved in serous fluid production, obstruction of the lymphatic system may play a significant role in the genesis of ascites.

Oxygen Consumption of Isolated Heart Muscle.

W. J. WHALEN (*Amer. J. Physiol.*, June, 1960) reports that oxygen consumption and resting and developed tension in isolated strips of mammalian myocardium were simultaneously measured in specially constructed chambers. In a resting preparation the oxygen consumption increased significantly as the length of the muscle was increased. The evidence suggests that the augmented QO_2 (µl/mg dry wt/hr.) is largely a result of the lengthening, *per se*, and is not due to the maintenance of tension. In the beating preparation, variations in rate and length accounted for most of the change in the oxygen uptake, tension being a less significant factor. The possible relationship of these findings to "Starling's law of the heart" is discussed.

Temperature Distribution over the Human Head.

M. EDWARDS AND A. C. BURTON (*J. appl. Physiol.*, March, 1960) state that two separate practical problems are the reduction of the total heat loss of the head, as by insulated helmets, and protection from frostbite, as by face masks. Solution of both problems benefits from knowledge of the distribution of skin temperature. Temperatures were measured with thermocouples at several points on three subjects, in the steady state, at environmental temperature of 0° C. Topographical differences were similar for the three subjects. Temperatures at a large number of points were measured in a single subject, and isothermal maps were drawn from the results. They show that the areas needing most protection from frostbite are the tip of the nose, the rim of the ears, the chin and the cheekbones. The areas of highest temperature (greatest heat loss) are those covered by the conventional insulated helmets. A face mask need not cover the area round the mouth where tactile sensitivity may make it uncomfortable. The isothermal map is correlated with the anatomical distribution of arterial blood supply.

Breath Holding During and After Muscular Exercise.

PER-OLOF ÅSTRAND (*J. appl. Physiol.*, March, 1960) reports that breath holding was performed: (*a*) at rest, (*b*) at the beginning of muscular work, (*c*) during the steady state of work, and (*d*) immediately after work. End-expiratory air was analysed for carbon dioxide and oxygen tensions. At breaking point the $PACO_2$ values were similar in (*a*) and (*b*) (below 52 mm. of mercury with air breathing), and in (*c*) and (*d*) respectively. The higher the work load the higher the $PACO_2$ in (*c*) and (*d*) (above 70 mm. of mercury at heavy work load breathing air; after oxygen breathing above 90 mm. of mercury). The $PACO_2$ values obtained were lower during and after work than at rest. These events and the increased "tolerance" for high carbon dioxide and low oxygen in breath holding during and immediately after exercise are discussed in light of the theory that proprioceptive impulses from working limbs are important in the control of respiration during exercise.

Anoxic Death in the Newborn.

S. CASSIN, H. G. SWANN AND B. CASSIN (*J. appl. Physiol.*, March, 1960) present the results of a systematic investigation of respiratory and cardio-vascular alterations conducted during the process of anoxic death in newborn pups, rabbits and kittens less than 24 hours old. Simultaneous measurements of respiration, heart rate and blood pressure were made. Considerable individual variation in the respiratory responses of newborn animals breathing nitrogen was noted. Under hypoxic conditions, respiratory failure may follow circulatory failure in the adult, whereas in the newborn respiratory failure always occurred long before circulatory failure. The effect of anoxia on the cardio-vascular system of the newborn at the time of the last breath was not as pronounced as might have been anticipated. Great individual differences with respect to blood pressure and heart rate throughout the period of anoxia were noted. The systolic blood pressure, on the average, was seen initially to fall more rapidly than the diastolic blood pressure or heart rate; it then slowly tapered off. The circulatory system was noted to function, although at hypotensive levels, for long periods of anoxia.

Regulation of Human Plasma Fluoride Concentration.

L. SINGER AND W. D. ARMSTRONG (*J. appl. Physiol.*, May, 1960) report that there is a constancy of plasma fluoride content of individuals who use communal water within the range 0·15 to 2·5 p.p.m. of fluoride. With an intake of 5·4 p.p.m. of fluoride in the communal water there is a slight but significant elevation of the plasma concentration. There is no evidence of a marked or prolonged rise of plasma fluoride content following the ingestion of 1·0 mg. fluoride or of a diurnal variation of plasma fluoride content. The mean plasma fluoride concentration of hospitalized patients is not different from that of normal people. The factors relating skeletal fluoride content to small and short-term rises of plasma fluoride concentration are discussed.

Magnesium Metabolism in Human Beings.

J. K. AIKAWA, G. S. GORDON AND E. L. RHOADES (*J. appl. Physiol.*, May, 1960) report that magnesium-28 was used to explore the kinetics of magnesium distribution in nine normal individuals and in 16 patients with various diseases. When magnesium-28 was given in 12 to 30 mEq of stable magnesium intravenously, plasma disappearance was rapid within the first several hours. In normal subjects a mean of 19·8% of the injected radioactivity was accounted for in the urine within 24 hours. Fæcal excretion was negligible, although equilibration of magnesium-28 in bile occurred within 18 hours. The specific activities of plasma and urine became stabilized by the eighteenth hour, and showed only a gradual decrease thereafter. Exchangeable magnesium contents in normal subjects ranged between 2·6 and 5·3 mEq/kg. of body weight—less than 16% of the estimated total body content of magnesium. Magnesium-28 was exchanged very slowly with the stable ion in bone, muscle and erythrocytes. The results in patients with diabetes mellitus and hepatic diseases showed no striking differences from those obtained in normal subjects.

Electric Response in the Mammary Gland.

A. FORBES, M. NEYLAND AND S. FOX (*J. appl. Physiol.*, May, 1960) report that their previous investigations have indicated that "let-down" sensation in the mammary gland in nursing, or on injection of "Pituitrin", is accompanied by slow electric response. This was believed to emanate from secreting-gland

cells or from contractile myoepithelial cells. Indirect control indicated that sweat-gland activity, related to emotional reaction, played little part in electric response from the breast. The authors have controlled this question of sweat-gland participation in observed response by recording simultaneously from the palm of the hand and from the areola in a non-lactating subject. It was found that spoken words evoking emotional reactions were accompanied by large electric responses from the palm, but from the areola there were either no responses or very small inverse deflections, presumably due to sweat glands in the skin of the thorax. Observations on lactating subjects showed that during nursing occasional deflections in the palmar record resembled those evoked in word tests, but in no case did the palmar record show a slow response synchronized with that recorded from the areola during the let-down. From these observations the authors conclude that sweat-gland reactions play little part in the characteristic let-down electric response led off from the areola. This must arise from a different source, presumably either the myoepithelial cells, the secreting cells, or both.

BIOCHEMISTRY.

Penicillin.

J. L. STROMINGER *et alii* (*J. biol. Chem.*, December, 1959) have studied the composition of the cell wall of *Staphylococcus aureus* and its relation to the mechanism of action of penicillin. Cell walls of two strains of *S. aureus* have been analysed quantitatively for amino sugars and amino acid content. The following substances were present in the relative molar amounts indicated: glutamic acid, 1; alanine, 3; glycine, 4; glucosamine, 2; muramic acid, 1. The ratio of glutamic acid, lysine, alanine and muramic acid was the same as that found in uridine diphospho-acetylmuramic acid-peptide which accumulates in penicillin-inhibited *S. aureus*. Further, the optical configurations of the amino acids in the wall were the same as those in the nucleotide, and the previously unidentified amino sugars, found only in these two places, were the same substance. By the methods used these sugars were identical with an authentic sample of muramic acid. These findings suggest that the uridine diphosphoacetylmuramic acid-peptide is a precursor of the bacterial cell wall and that the mechanism of action and selective toxicity of penicillin are related to inhibition of biosynthesis of the bacterial cell wall.

Heparin.

I. DANISHEFSKY AND H. B. EIBER (*Arch. Biochem.*, November, 1959) have studied the metabolism of heparin. Heparin-^{35}S was injected into dogs, and the properties of the radioactive material excreted in the urine were studied. It was found that after administration of small doses, all the label is excreted as inorganic sulphate. On the other hand, after injection of larger amounts the urine contains an appreciable portion of the ^{35}S associated with heparin and other mucopolysaccharide material. It is concluded that as a result of metabolic degradation the sulphate linkages of heparin are cleared. However, the capability of the animal to perform this hydrolysis is limited so that when excess amounts are administered a significant portion is excreted unchanged or only partially desulphated.

Collagen.

B. BACHRA AND A. E. SOBEL (*Arch. Biochem.*, November, 1959) have reported on the mineralization of collagen. Acid-soluble collagen, when reconstituted with chondroitin sulphate, heparin, lauryl sulphate, sodium chloride, by dialysis with sodium acetate, or by calcifying solution, mineralized when placed in a solution employed for calcification *in vitro*. No decisive difference was observed between collagen obtained from rat tail tendon and that from skin, except when calcifying solution was used as the precipitant. Improved calcifiability was obtained when the fibres were reconstituted with sulphate ester, from an acetic acid extract of sodium chloride-precipitated collagen. It is concluded that reconstituted fibres of acid-soluble collagen have calcifiability as an intrinsic property.

Growth.

H. EAGLE (*Proc. nat. Acad. Sci.* (*Wash.*), April, 1960) has studied the sustained growth of human and animal cells in a protein-free environment. Human and mouse cells could be grown regularly in suspension culture in a protein-free and chemically defined basal growth medium, if that culture was equilibrated across a cellophane membrane with medium containing 1·5% dialysed serum and a dialysed pancreatic extract. Only occasional and relatively slow growth was obtained when the enzyme preparation was omitted from the "feeder" compartment containing protein. It is suggested that the primary role of serum protein in suspension cultures of mammalian cells is to provide essential growth factors of small molecular weight, either initially bound to the serum, or formed from it on proteolysis.

Cholesterol.

H. WHITEHOUSE *et alii* (*Arch. Biochem.*, April, 1960) have shown that feeding ferric, nickel or cobalt chloride to male Wistar rats increased the in-vitro oxidation of cholesterol by liver mitochondrial preparation fortified with boiled liver supernatant fraction. This effect is probably due to enhancement of the stimulatory activity of the supernatant fraction, rather than to reduction in the circulating bile salts known to control cholesterol oxidation by the liver. Addition of ferric ions specifically activated cholesterol oxidation. Cobalt ions non-specifically activated mitochondrial oxidation of cholesterol and other substrates (pyruvate and octanoate). Other metal ions (Ni^{++}, Fe^{++}, Mn^{++}, Zn^{++} and Cu^{++}) were either without effect or inhibited both cholesterol and pyruvate oxidation.

Phospholipides.

W. GABY AND R. SILBERMAN *Arch. Biochem.*, April, 1960) have reported that phospholipides extracted from liver slices which have been exposed to *dl*-leucine or *dl*-tyrosine were found to incorporate these amino acids as part of their molecular structure. The amino acids are chemically bound to the phospholipides and could not be separated from the lipide complex by electrophoresis. The amino acids could be demonstrated in the aqueous fraction of the acid hydrolysis of the phospholipides by paper chromatography. Phospholipides extracted from liver cells which had been heated at 60° C. for 45 minutes prior to incubation with leucine-*l*-^{14}C did not incorporate the radioactive compound and there was no in-vitro adsorption of ^{14}C labelled leucine by the purified phospholipides.

PHYSICAL MEDICINE.

Kinæsiology of the Hand.

C. LONG *et alii* (*Arch. phys. Med.*, May, 1960) present a method for the simultaneous recording of hand motion and electromyograms to investigate the kinæsiological balance between intrinsic and extrinsic muscles. Bipolar wire electrodes provide the pick-ups for multi-channel, ink-written electromyographic tracings coupled with motion pictures. Motion pictures are reduced to motion curves by single frame analysis and matched to the corresponding electromyograms. Further reduction of data for velocity and acceleration of moving segments is carried out through electronic computers and plotters. It is hoped by this method to investigate further the validity of the Bunnell hypothesis.

Clinical Problems in Speech and Language.

N. E. WOOD (*Arch. phys. Med.*, March, 1960) states that speech pathologists are concerned with the rehabilitation of a wide assortment of problems that impede or interrupt communication. Research has shown that speech and language disorders occur randomly throughout the population without regard for age, sex, race or socio-economic level. Since speech is a learned function, speech disorders, whether congenital or acquired, are either symptomatic of another problem or causally connected with a more basic disorder. For this reason, the speech pathologist most often functions as a part of a rehabilitation team. Speech disorders cannot be considered peripheral problems. Although disorders of voice, articulation, stuttering, hearing and aphasia, or associated problems of cerebral palsy or cleft palate are often brought to the attention of the speech pathologist, diagnostic information and suggestions for treatment must be available from all other personnel who have examined and/or treated the patient. The role of the speech pathologist must be removed from demands for miracles, for these demands can result only in quackery. Speech pathology must remain a scientific investigation with practical planning, imaginative procedures and hard work. Because of this wide diversification of speech and language problems, the author confines herself mainly to the problem of language disorders. She discusses generally the rehabilitation of children and adults with language disorders, and more specifically aphasia, alexia and agraphia as caused by cerebral vascular accidents, brain tumours or head injuries, and congenital aphasia caused by anoxia, febrile episodes or birth injury.

Medical Practice.

THIRD ANNUAL REPORT TO THE PRIME MINISTER BY THE NATIONAL RADIATION ADVISORY COMMITTEE, JULY, 1960.

MEMBERSHIP OF THE NATIONAL RADIATION ADVISORY COMMITTEE.

PROFESSOR SYDNEY SUNDERLAND, F.A.A. (Chairman), Dean of the Faculty of Medicine, University of Melbourne. Professor Sir Edward Ford, O.B.E. (Deputy Chairman), Director, School of Public Health and Tropical Medicine, University of Sydney. Professor J. P. Baxter, C.M.G., O.B.E., F.A.A., Chairman, Australian Atomic Energy Commission. Professor A. M. Clark, Professor of Zoology, University of Tasmania. Mr. D. A. Gill, Former Chief, Division of Animal Health and Production, C.S.I.R.O. Dr. W. P. Holman, Medical Director, Cancer Institute Board of Victoria. Professor E. S. J. King, F.A.A., Professor of Pathology, University of Melbourne. Sir Leslie Martin, C.B.E., F.R.S., F.A.A., Chairman, Australian Universities Commission. Mr. D. J. Stevens, Director, Commonwealth X-ray and Radium Laboratory. Professor E. W. Titterton, C.M.G., F.A.A., Professor of Nuclear Physics, Australian National University. Mr. J. R. Moroney (Secretary), Department of Supply.

1. INTRODUCTION.

1. The National Radiation Advisory Committee was appointed by the Commonwealth Government in May 1957 to provide guidance on any matter pertaining to the effects of ionizing radiation on the Australian community. The Committee met on eleven occasions during the year under review, and Mr. E. L. Cook, M.B.E., Assistant Secretary (Research and Development), Department of Supply, attended many of these meetings at the invitation of the Chairman

2. From the several years of experience since its formation, the Committee recommended to the Prime Minister that there would be advantages in adding to its membership with the object of strengthening the representation of certain scientific disciplines, which are of fundamental importance in its field of responsibility. During the year under review a scientist from each of the fields of public health, pathology and genetics was invited to join the Committee. The three additional members are Sir Edward Ford, Professor King and Professor Clark.

3. In its two previous annual reports to the Prime Minister the Committee assessed some radiation problems considered to be of particular importance to the Australian community. Special attention was devoted to: (i) legislative control of the uses of ionizing radiation in Australia, (ii) the use of ionizing radiation in medical practice, and (iii) radioactive fallout following nuclear weapon tests.

These three matters have been kept under review and they are considered again in the present report; particular attention has been devoted during the past year to the question of Federal legislative control of the uses of ionizing radiation in Australia, and it has been the subject of a separate report.

4. In addition to reviewing these matters, the Committee has continued to assess the accumulating information on the biological effects of ionizing radiation. The first annual report, July 1958,[1] presented a summary of current knowledge of these effects, and the second annual report, July 1959,[2] discussed recent developments as they impinged on the Committee's assessment of possible biological consequences of radioactive fallout to the Australian population. Significant advances in the investigation of these biological effects have been made since the summary was prepared in 1958, and such developments are of fundamental importance to the Committee's studies. Accordingly, the previous summary has been revised and a brief account is given in the present report of current knowledge of these effects.

2. REVIEW OF THE RECOMMENDATIONS OF THE NATIONAL RADIATION ADVISORY COMMITTEE CONTAINED IN ITS ANNUAL REPORTS 1958 AND 1959.

(a) The Use of Ionizing Radiation in Medical Practice.

5. In its previous reports the Committee stressed the need for a balanced approach in assessing the hazards to the Australian population which may arise from the use of ionizing radiation in medical practice. Great advantages to the community are to be obtained from such practices but it is essential that the level of exposure should be kept to a minimum consistent with medical necessity.

6. In this regard the Committee notes that the National Health and Medical Research Council has amended its model Radioactive Substances Act and Regulations to require that all X-ray equipment for use on man be registered, subject to its continuing compliance with prescribed technical standards. The Committee also notes that these amendments to the model legislation have been commended to the State Governments with a view to incorporation in legislation already in existence, or in course of preparation. The Committee strongly supports the action taken by the Governments of Queensland, South Australia and Western Australia in adopting these amendments.

(b) Federal Legislative Control of the Uses of Ionizing Radiation in Australia.

7. In its report of July, 1959, the Committee recommended that the Commonwealth Government should accept full responsibility as early as possible for the legislative control of all uses of ionizing radiation throughout Australia. The Prime Minister sought from the Committee a statement of the reasons which led it to such a strong conclusion. In preparing this statement for the Prime Minister the Committee extended its study of the legislation now being developed by the State Governments and by other Governments.

8. At present each State Government is responsible for controlling the use of ionizing radiation in its own territory and for providing the necessary safeguards to the community. On the advice of the Commonwealth Government the States have considered the passage of legislation based on model legislation prepared by the National Health and Medical Research Council with a view to achieving uniformity.

9. The States were first advised of the Model Act in 1953 and of the Model Regulations in 1957. Although most States have taken some action there has been considerable delay in the adoption and implementation of legislation*; at the present time all are not adequately equipped to effect even minimal control over the uses of ionizing radiation.

10. There are significant differences in the legislation adopted by the States, and in the provisions for its implementation. These differences have arisen despite the efforts of Federal authorities to promote uniformity. Some of the differences will become critical in the future, particularly with the increasing use of ionizing radiation, and (i) with the need for the adoption of new standards and procedures following further scientific research, (ii) as Australia becomes party to international conventions, (iii) with the extensive application of radioisotopes in industry, (iv) as nuclear power is introduced in Australia, (v) with the control of any emergency situation which might arise as a result of a large-scale radiation accident, (vi) with the need for the safe disposal of increasing quantities of radioactive materials, and (vii) with interstate commerce or transport involving radioactive materials or equipment capable of producing ionizing radiation.

11. The increasing use of ionizing radiation in industry, medicine, agriculture and fundamental research in Australia will inevitably increase the potential hazards to the Australian population. These possible dangers to Public Health are of national importance; they will not be limited by State boundaries. This situation presents a major public health problem which can only be treated effectively on a national basis. The magnitude of the possible hazards, together with the complexity of the necessary control measures and the need for maintaining them at a uniformly high standard, require a uniform and closely co-ordinated programme throughout Australia to ensure the safe use of all sources of ionizing radiation. Such a programme does not exist at present, nor can its simple development from existing arrangements be envisaged. The Committee believes that it can only be effected by Commonwealth legislation.

3. REVIEW OF STUDIES BY THE NATIONAL RADIATION ADVISORY COMMITTEE CONTINUED DURING 1959-60.

(a) Biological Effects of Ionizing Radiation.

12. In its first annual report, July, 1958, the Committee presented a summary of current knowledge of the biological effects of ionizing radiation. During the half century that

* Tasmania: Radioactive Substances Acts, 21st September, 1954 and 3rd April, 1957; Regulations: none promulgated. Western Australia: Radioactive Substances Act, 30th December, 1954; Regulations: 12th December, 1958. South Australia: Health Act Amendment Act, 15th November, 1956; Regulations: none promulgated. New South Wales: Radioactive Substances Act, 25th March, 1957; Regulations: 20th March, 1959 and 9th October, 1959. Queensland: Radioactive Substances Act, 7th May, 1958; Regulations: none promulgated. Victoria: Health Act, 1958; Regulations: 29th June, 1959.

radiation effects have been observed definite conclusions have been drawn as to their nature and significance. Knowledge of the mode of action of ionizing radiation on living tissues is increasing, and radiation is now one of the best understood of the environmental hazards. However, as knowledge advances, opinions and hypotheses require constant revision. The Committee now considers it appropriate to revise its previous summary, especially as recent developments are of particular importance to its field of responsibility.

13. Radiation effects are of two main kinds according to whether the sex cells of the body are affected (genetic effects), or other tissues (somatic effects).

Genetic effects are produced by changes or mutations in the sex cells; they may be produced only by direct irradiation of the sex glands of the individual, and only if the radiation dose is sufficient to damage but not destroy the sex cells. Any such effect would only be manifested in the subsequent generations arising from the individual irradiated, so that, to be significant, the irradiation must occur before the age of reproduction is passed. Geneticists believe that nearly all mutations are disadvantageous. The very small proportion likely to prove beneficial can be used by the plant or animal breeder, who is able to select certain individuals for breeding purposes, while rejecting others. In the case of man, however, selective breeding does not apply. Furthermore, the natural processes of selection operating upon human populations are being continually reduced in effectiveness by the advances of medical science. Therefore, the increased social burden resulting from many new deleterious mutations would far outweigh any possible benefits which might be derived in a few cases from the advantageous mutations.

Somatic effects are the changes induced in the cells of organs and tissues of the body other than the sex cells.

14. *Information on the biological effects of ionizing radiation* has been obtained from: (i) a study of individuals accidentally exposed to radiation, (ii) the use of radiation in medical treatment, (ii) studies of the populations of Hiroshima and Nagasaki, and (iv) experiments on animals and other organisms.

15. A most important technical advance, made in the United States in the past few years, has been the development of methods which enable pure lines or clones (families) of human cells to be grown in tissue cultures in the laboratory. This may lead to great advances in our understanding of the special problems of human radiation genetics.

16. *The degree of effect of ionizing radiation on living tissue* depends on: (i) the amount of the body irradiated, (ii) the tissue or organ affected, (iii) the radiation dose to the particular tissue or organ, and (iv) the rate at which the dose is delivered.

17. The response of some tissues to radiation differs if the same total dose is received as a single exposure in a short time (high dose rate), a single exposure over a long time (low dose rate) or as various fractions of the total dose over an extended period. That this is the case for somatic effects has been known for some time; recovery processes appear to take place in the tissue irradiated. However, a similar phenomenon for genetic effects has recently been established for a number of species; radiation delivered at a low dose rate is less effective in causing genetic changes than an equivalent dose delivered at a much higher rate.

18. In view of the variations that are observed in the biological effects of radiation in different species, conclusions drawn from experiments with animals must only be applied to man with proper reservations. In some cases, however, difficulties and sources of error are known and results obtained from animals can be correlated with those obtained in man; such animal experimentation can be accepted as a valuable method of providing information in this field.

19. *The inhibition or enhancement of some somatic effects of ionizing radiation* may be brought about by a variety of chemical or physical means. It is now recognised that the chemical changes induced in tissue by the absorption of ionizing radiation are of great importance in the processes leading to biological damage. Inhibition of these changes can significantly diminish the effects of irradiation. One of the most important of these chemical changes is the liberation of oxygen. This phenomenon is being utilized to advantage in the treatment of diseased tissue, for it is possible to enhance the effects of X-rays used therapeutically by increasing the oxygen in the air breathed by a patient undergoing treatment. Other benefits may be obtained by reducing or neutralizing the action of oxygen in irradiated tissue, and so preventing some biological damage; investigations with various substances, known to inhibit the action of oxygen, are being carried out to develop agents which offer some biological protection against ionizing radiation.

20. Knowledge of the *quantitative relation between the magnitude of the biological effect and the radiation dose* is required for any evaluation of the hazards of radiation. High level acute irradiation produces definite effects of easily recognizable type. On the other hand, low level chronic irradiation may produce relatively little demonstrable effect. A pathological principle is that tissues will respond rapidly to their environment, and if, after some disturbance, it returns to normal, the tissues begin to recover from the changes induced. The normal expectancy of recovery from most diseases depends on this phenomenon.

(a) Somatic Effects.

(i) Slight *life shortening* has been observed in animals following exposure to high levels of radiation. This effect is attributed not only to damage to specific tissue, but also to an acceleration of ageing processes. At comparatively high levels of irradiation an increased life shortening was observed with increased dose. Interest has been shown in the possibility of slight shortening of the life span of man following irradiation; however, in studies of human population groups exposed over long periods to much higher levels of radiation than would normally occur, the effect was sought and not found.

(ii) The *occurrence of tumours* has been observed in animals and in man following exposure to high levels of ionizing radiation. Again, from experiments with animals at high dose levels, it has been established that the induction of tumours increases with increasing radiation dose. At lower dose levels the experimental results suggest a diminished effect per unit of radiation absorbed. It is concluded from this evidence that if any increase in the incidence of tumours in man does result from exposure to low levels of radiation, it cannot be predicted from observed incidences at high dose levels.

(iii) Much data are available on radiation-induced *leukæmia* in experimental animals and some data are available for man, but as in other studies the more reliable information has been obtained at high dose levels. The data at lower dose levels suggest a diminished induction of leukæmia per unit of radiation absorbed. On this evidence it is no longer acceptable to predict the effects on human populations of low level exposure over long periods from the observed effects of much larger doses given at high dose rates.

(b) Genetic Effects.

Reference was made in paragraph 17 to the recent discovery that ionizing radiation delivered at low rates may be less effective in causing genetic changes than an equivalent dose of radiation delivered at a high dose rate. The preliminary results (3) of a further investigation at still lower dose rates have failed to reveal a further decrease in effectiveness for causing genetic changes. Although the data are still insufficient to establish the precise quantitative relation between dose and genetic effect at low doses and rates, a rate effect has been reported for several kinds of living organism, including the mouse. It is probable that a similar situation will be found to hold for man. No evidence is yet available for a dose or a dose rate below which no genetic effect occurs.

21. The population of Australia is exposed to a low level of ionizing radiation arising almost entirely from the natural background radiation and from the medical use of X-rays; a very small contribution is made by other sources such as fallout from nuclear weapons tests and increasing uses of ionizing radiation in the community. With the exception of the medical use of X-rays, the radiation doses are delivered to the population at low dose rates.

In evaluating the biological hazards which may be associated with such radiation exposure a quantitative relationship between dose and effect must be assumed, as the form of the relationship is not known at the dose levels of interest. In the past it was assumed that both genetic and somatic effects were in direct proportion to the radiation dose, irrespective of the period of time over which the dose was delivered. There is some circumstantial evidence for such an assumption, but it was also adopted for reasons of simplicity and because it constituted a pessimistic approach ensuring that the effects would not be underestimated. The quantitative relationship of genetic effect to dose, assumed

in the Committee's earlier evaluations,[2] was taken from investigations at high dose rates. It is considered prudent to continue with these assumptions for the present but with the knowledge that assessments performed on this basis incorporate a substantial margin of safety.

(b) Global Fallout in Australia.

22. The programme of measuments of fallout in Australia, under the direction of the Atomic Weapons Test Safety Committee, is continuing. During the year under review the total radioactivity in fallout decreased to very low levels, in many cases below the minimum activity detectable with the equipment in use. For this, and for other reasons, more sensitive techniques have been adopted and are now being incorporated throughout the monitoring network. The fallout results for 1959, and a discussion of these techniques are being published by the Safety Committee.[4]

23. The Atomic Weapons Tests Safety Committee has continued its extensive survey of strontium 90 in selected materials collected throughout Australia. Approximately 600 samples of human bone tissue, foodstuffs and soil collected during 1959 are being analysed. Complete results are not yet available but the data on strontium 90 in soil from the Australian survey, and from a world wide survey,[5] indicate that the levels in Australia rose by 1 millicurie per square kilometre (mc/km²) during 1958/59 to an average total of 4 mc/km². The average increase during the same period in similar latitudes in the northern hemisphere was 10 mc/km², to a level of 25 to 30 mc/km² in the United States and 15 to 20 mc/km² in other areas. This marked increase in the level of strontium 90 deposited in the northern hemisphere during 1959 arose mainly from the high yield weapon tests carried out by Soviet Russia in the Arctic in October and November, 1958.

24. Further measurements of the stratospheric reservoir of strontium 90,[6] and comparisons with material-balance studies of strontium 90 in the biosphere,[7] lead to the conclusion that the total burden in the stratosphere is less than that hitherto assumed in making predictions of future levels of strontium 90 in the environment. In accepting the previous estimates for its assessment of possible biological consequences of fallout to the Australian population,[3] the Committee has overestimated these possible consequences.

25. Data from experimental studies on the absorption of strontium by plants[8] indicate that for some pasture grasses the absorption is dependent on the level of strontium at the basal tissues and surface roots of the grass rather than on the total accumulation of strontium at all depths in the soil. The grasses examined are important in the uptake of strontium 90 in milk, known to be a major dietary source of strontium 90 for the Australian population. The level of strontium 90 at the surface of the ground is determined mainly by the rate of deposition of fallout and this is decreasing rapidly. Earlier assessments of the possible biological consequences of fallout, including those of the Committee, and which are based on total accumulation of strontium 90 in the soil, over-estimate these possible consequences.

26. The possible hazards to the Australian population, as a result of its exposure to the very low levels of radiation arising from all testing of nuclear weapons to date, were evaluated by the Committee in its report of July, 1959. The Committee pointed out that while a realistic assessment of the possible biological consequences could be made, such consequences were not amenable to precise calculation, and would be too few to be detected by demographic survey. Some of the previous uncertainties still remain, but the data discussed above, together with recent developments in the investigation of genetic and somatic effects of ionizing radiation, indicate that the Committee's report of July, 1959, over-estimated the possible consequences. The Committee re-emphasizes the conclusion reached in its earlier report that even on the most pessimistic assumptions the risks to the Australian population are insignificant when compared to the normal hazards of everyday life.

4. Studies by the National Radiation Advisory Committee Initiated during 1959-60.

Disposal of Radioactive Waste in Australia.

27. Present legislative responsibility for the control of radioactive waste rests with the State Governments, and although legislation has been enacted in all States it has not yet been given effect. With the exception of internal provisions in a few major organisations there are no co-ordinated arrangements for the disposal of radioactive waste in Australia. Each institution looks after the problem according to its own assessment of the position, and in general the materials are stored under what are considered to be safe conditions. The use of radioactive materials in Australia is not yet sufficient to make waste disposal a major problem, but with the expected increasing application of radioisotopes the problem could rapidly assume significance. A national policy to deal with this situation must be developed. The problem is now being considered by the Committee.

5. Summary

The Medical Use of Ionizing Radiation (Paragraphs 5 and 6).

28. A balanced approach must be maintained in assessing the hazards to the Australian population which may arise from the use of ionizing radiation in medical practice. Great advantages to the community are to be obtained from such practices, but it is essential that the level of exposure should be kept to a minimum consistent with medical necessity.

Federal Control of the Uses of Ionizing Radiation in Australia (Paragraphs 7 to 11).

29. The increasing use of ionizing radiation in medicine, agriculture, fundamental research and industry in Australia will inevitably increase the potential hazards to the Australian population. These possible dangers to Public Health are of national importance; they will not be limited by State boundaries. This situation presents a major public health problem which can only be treated effectively on a national basis. A uniform and closely co-ordinated programme throughout Australia is necessary to ensure the safe use of all sources of ionizing radiation. The Committee believes that such a programme can best be effected by Commonwealth legislation.

Global Fallout in Australia and Its Biological Implications (Paragraphs 22 to 26).

30. Measurements of global fallout in Australia have continued. Comparison of Australian and overseas data indicates that during 1959 the increase in fallout levels in Australia was one tenth the increase of those in the more densely populated regions of the northern hemisphere. Australian fallout levels are now one fifth to one fourth of those in the northern hemisphere.

In its report of July, 1959 the Committee presented estimates of upper limits for possible biological consequences to the Australian population of present and future fallout from nuclear weapon tests to date. Continuing measurements of world wide fallout together with recent developments in the investigation of biological effects of ionizing radiation indicate that the possible consequences were over-estimated. The Committee re-emphasises the conclusion reached in its earlier report that even on the most pessimistic assumptions the risks to the Australian population are insignificant when compared to the normal hazards of everyday life.

SYDNEY SUNDERLAND, E. FORD, J. P. BAXTER, A. M. CLARK, DUDLEY A. GILL, W. P. HOLMAN, E. S. J. KING, L. H. MARTIN, D. J. STEVENS, E. W. TITTERTON, J. R. MORONEY (Secretary).

References.

1 "Report to the Prime Minister by the National Radiation Advisory Committee, July, 1958", *Med. J. Australia*, 2, 398-400 (1958), 20th September.

2 "Report to the Prime Minister by the National Radiation Advisory Committee, July, 1959", *Med. J. Australia*, 2, 903-908 (1959), 12th December.

3 Russell W. L. and Kelly E. M., "Mutation Frequency at Low Radiation Intensity", Paper presented to the Annual Meeting of the United States National Academy of Sciences, April 25th to 27th, 1960.

4 Blake R. J., Dwyer L. J., Martin J. H. and Titterton E. W., "Global Fallout in Australia, 1959", *Australian J. Sci.*, 23 (1959), September (in the press).

5 Alexander L. T., Jordon R. H., Dever R. F., Hardy E. P., Hamada G. H., Machta L. and List R. J., "Strontium 90 on the Earth's Surface", United States Atomic Energy Commission Fallout Programme, Quarterly Summary Report, July 1st, 1960, pp 195-229.

6 Feely H. W., "Strontium 90 Content of the Stratosphere", *Science*, 131, 645-649 (1960), 4th March.

7 Hearings before the Special Sub-Committee on Radiation of the Joint Committee on Atomic Energy of the United States, May 5th to 8th, 1959, "Fallout from Nuclear Weapons Tests", pp. 841-904.

8 Burton J. D., Milbourn G. M. and Russell R. S., "Relationship between the Rate of Fallout and the Concentration of Strontium 90 in Human Diet in the United Kingdom", *Nature*, 185, 498-500 (1960), 20th February.

British Medical Association.

NEW SOUTH WALES BRANCH: SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on May 26, 1960, in the Robert H. Todd Assembly Hall, British Medical Association House, 135 Macquarie Street, Sydney, Dr. B. A. COOK, the President, in the chair.

Fractures of Facial Bones.

DR. A. B. K. WATKINS read a paper entitled "Recent Fractures of the Nose" (see page 737).

DR. D. OFFICER BROWN read a paper entitled "Fractures of the Maxilla" (see page 738).

DR. J. S. BAIRD read a paper entitled "Fractures of the Mandible". He said that he would confine his remarks to the important general principles. With regard to diagnosis, he said that many of the cardinal signs and symptoms were frequently absent, whereas disturbance of occlusion of the teeth and pain on chewing were frequent findings. X-ray examination was the final and most satisfactory diagnostic procedure, and all parts of the mandible should be shown, as multiple fractures were extremely common.

Dr. Baird then said that he wished to deal in somewhat more detail with methods of reduction and fixation. Despite the diversity of opinion as to method and the dogmatic statements of some workers, most methods had been successfully used. It seemed reasonable to conclude that none should be absolutely discarded. A combination of techniques was frequently the answer. No hard and fast rules should be set down, as the best results would follow an intelligent understanding of the aims and objects of a number of methods embodying a number of general principles.

Dr. Baird went on to discuss some of the methods briefly. First he referred to bandaging, and said that in general, if the method of fixation or reduction was dependent on that time-honoured measure, the result would be likely to be poor. The four-tail bandage, still frequently seen, could be expected to do more harm than good. A relatively satisfactory form of bandage was the barrel bandage. Its chief use was to make the patient feel that something had been done, and to remind him and those in his environment that he had a fracture. Dr. Baird pointed out that the remarks he had made naturally did not apply to the use of firm pressure bandages after surgery, such as open reduction of the fracture.

Dr. Baird then referred to interdental eyelet wiring and chain lace wiring. He said that their use in selected cases gave good results, and all should be familiar with the simple procedure. The method was especially useful as a temporary measure whilst splints were being constructed.[1] The fracture arch combined with wiring and intermaxillary elastic traction was a modification of the method just described, and was still greatly favoured in the U.S.A. for routine use. The cast silver-copper alloy ferrule or cap splints, with their various modifications and refinements, were gaining their rightful place, since the external pin fixation methods had begun to lose their popularity as a universally applicable means of treatment. At times it was necessary to resort to sectional splints connected by dome locking plates or fish plates. The Gunning type splint, specially constructed of acrylic for the individual patient or improvised by adaptation of the patients' own dentures, provided a useful method of or adjunct to treatment when the patient was edentulous—for example, combined with (*a*) circumferential wiring and/or peralveolar wiring, (*b*) interosseous wiring, (*c*) pin fixation. Dr. Baird then described interosseous wiring of bone ends after open reduction by (*a*) lower border figure-of-eight and direct wiring with extraoral approach, and (*b*) upper border intraoral wiring. Discussing pin fixation, Dr. Baird said that it had not been as successful as was expected, but was still a useful method in selected cases. Pairs of converging stainless steel pins clamped together and connected by extraskeletal bars and universal joints were employed. Types of pin appliances were Roger Anderson, Clouston Walker, MacGregor Underwood. Cast splints, with an extraoral bar for the attachment of a pair of clamped converging pins, etc., as previously described, might be used. Precautions to avoid electrolytic action were necessary. Other methods which had a decreasing number of supporters were the transosseous use of Kirschner wire, and the use of vitallium plates and screws.

[1] Dr. Baird showed a number of slides to illustrate all the procedures described in his paper.

Discussing fractures of the neck of the mandible, Dr. Baird said that a considerable increase in their incidence had been noted in recent years. For practical purposes they could be considered as falling into three main types. The first type was the fracture without dislocation of the condylar head, but with upward and backward displacement of the angle of the mandible, and usually with postero-lateral overlap of the proximal segment at the site of the fracture. Occlusion deviated towards the injured side. The objects of treatment were union and a functioning condylar head; thus intermaxillary fixation was necessary for three weeks. The second type was the fracture with dislocation and anteromedial displacement of the head of the condyle. The angle was similarly displaced, and again there was usually deviation towards the side of the injury. The object of treatment was fibrous pseudarthrosis (false joint); thus guided movement was instituted after ten days. The third type comprised bilateral fractures with or without dislocation, in which the mandible was displaced posteriorly. Suitable modification of treatment was a matter of judgement. In fracture-dislocation, surprisingly good functional results were usually obtained by the judicious use of guide planes and counteracting intermaxillary elastic traction combined with movement, after the initial pain had subsided. The resultant false joints seldom gave rise to any considerable permanent disability; in other words, disability usually ended with litigation.

DR. E. W. GIBSON, in opening the discussion, said that the fact that members of three different specialties had been called together to discuss the subject of facio-maxillary injuries gave the key to their treatment. It was essentially a team job. That could be seen in the evolution of facio-maxillary surgery over the last 20 years and the emergence of the specialized facio-maxillary unit. Those units had grown up in the United Kingdom and in Australia usually in association with a plastic surgery service, and that had shown itself to be a natural and logical association.

Dr. Gibson said that during a visit to the U.S.A. in 1959, he had been struck by two or three differences in their approach to facio-maxillary injuries and in their technique in dealing with them. In the first instance, they carried out many more open reductions and internal fixations of facial fractures than was the custom in Australia. That approach was especially advocated by Milton Adams of Tennessee and by Reed Dingman of Ann Arbor. When he questioned them about it, they had argued that the treatment of those fractures had been too strongly influenced in Britain by the dentists and in particular by Sir Kelsy Fry, one of those who contributed most to dental techniques in that field. They argued that complicated and uncomfortable devices had been worked out by the dentists to deal with those fractures which could much more readily be dealt with by a single surgical operation. Dr. Gibson said he thought that a more important reason for the emphasis on the surgical approach was that the surgeons had fallen out with the dentists. That seemed to arise from the fact that some dentists were ambitious to expand their activities into areas which many held were beyond their sphere of competence. Such fields were cleft lip and palate surgery and radical surgery in cancer of the head and neck. When those protests were voiced by the surgeons, a good deal of ill feeling was engendered on the part of the dentists, in particular, the senior members of the university teaching staff, who in turn were reluctant to cooperate with the surgeons in the treatment of that type of injury. Dr. Gibson said that he did not hold with those views or practices. Fortunately in Australia surgeons enjoyed the most harmonious relations with their dental colleagues, and did in fact often work simultaneously with them. Dr. Gibson was sure that no one who had seen sufficient of those patients treated by dental methods could deny that a fracture of the mandible or maxilla requiring fixation was best treated by dental splints when suitable teeth were available. The dental splints were sometimes supplemented by additional internal fixation. Furthermore, the problem of adjustment of occlusion and the whole dynamics of the masticatory process were essentially matters for the dental expert.

Dr. Gibson went on to say that he had been interested to hear Dr. Watkins say that he treated some simple fractures of the nose without the use of a splint. He himself had found a plaster of Paris splint of great help in those cases in the control of swelling and œdema of the soft tissues, in addition to its function of controlling the bone fragments. In the late treatment of old compound fractures of the nose, one might carry out a scar excision and refracture of the nasal bones at the same time. It had been his practice to apply the plaster of Paris splint directly to the skin after covering the wound only with a small piece of *tulle gras*. He had been

struck with the excellent healing of the wound under the plaster with a minimum of reaction and stitch marks, presumably owing to the control of œdema of the wound edges. As a result of those observations, he now dressed a simple scar excision wound by the same plaster of Paris technique even when no infracture had been carried out. Dr. Watkin's account of his ingenious modification of Carter's splint was most interesting. Dr. Gibson confessed that he had never found the need for any mechanical splint. He had found plaster of Paris a most satisfactory medium; it could be made to adapt itself to the infinite variations in shape and size found in the human nose. When the fracture was first reduced, it was surprising how much the soft-tissue swelling and œdema could be reduced by massage and manipulation. If that was done and the plaster was carefully moulded, it would retain close contact with the skin for the usual two-week immobilization period. However, in some cases it might be necessary to change the plaster at the end of the first week, and especially if sutures had to be removed. There was a group of severe comminuted nasal fractures — especially those combined with gross total middle-third injuries—which could not be controlled by plaster of Paris alone. Transfixion wires tied over lead plates usually controlled them adequately.

Dr. Gibson then said that he agreed with Dr. Baird that pin-fixation methods for controlling fractures of the mandible had in general been disappointing, and that method had been almost abandoned. More accurate and certain methods were available.

Finally, he thought that a little thought should be devoted to prevention. There was no doubt that motor accidents were the commonest causes of those injuries, with the possible exception of Rugby League football. He believed that it behoved the medical profession to bring what influence it could to bear on the manufacturers of motor-cars to give more attention to safety factors in the design of their vehicles. He was aware that in the past manufacturers had been reluctant to lay too much emphasis on safety factors, in the fear that their competitors might imply by unscrupulous advertising methods that their vehicle must be unsafe because it required such additional safety devices. Dr. Gibson considered that seat belts should be standard equipment, and that the interior of motor-cars should be designed to eliminate dangerous protrusions and padded in the obvious impact areas. He thought it significant that of the plastic surgeons he met in the U.S.A., four out of five had seat belts fitted to their cars. Since then he had also fitted them. He was convinced that the early and efficient treatment of facio-maxillary injuries, especially the severe combined injuries, was best carried out by a properly constituted facio-maxillary service, where all methods, dental or surgical, were readily available, and where a decision could be made as to the best method of treating that particular patient.

DR. G. HALLIDAY suggested that the people who dealt mostly with the maxillary bone, the ear, nose and throat surgeons, must play their part also. In earlier days he had tended to wait for the swelling to subside and then see what to do later. The speakers had all pointed out the urgency of the matter; bone deformity was present, and a definite attack on the bony structure that had been disturbed was required.

Dr. Watkins said that he appeared to have given Dr. Gibson the impression that splints were infrequently required in nasal fractures; that was not so. They could be dispensed with only in one in 20 such cases. Dr. Gibson had evidently thought that he (Dr. Watkins) could manage without splints in comminuted fractures; in only about one in 100 such cases could one manage without a splint, and it was handy to have it in that case.

Dr. Baird said that he preferred the ferrule splint to the cap splint. It was easy to remove with dental forceps; one blade was put on the crown of the tooth and the other under the ledge; a small squeeze was given, and one passed to the next tooth, and so on. It did not take long to loosen all of them. Slitting forceps were used for an isolated tooth.

Dr. Watkins said that he admired the way in which dentists took impressions and made complicated splints. He asked how they took cap splints off.

Dr. Cook, from the chair, said that those present had heard an excellent symposium on an important and worrying problem. Those who had been in general practice had met it often. Teamwork was certainly the answer. He had found the dentists very cooperative, and their knowledge of the anatomy and of function and occlusion was most useful in the construction of a prosthesis to restore the anatomical situation. In the cities, the problem should always be dealt with by expert teams. However, even in country districts, with cooperation and good anæsthesia, satisfactory results could be achieved in most cases. Dr. Cook, in conclusion, thanked the speakers for their papers. He said that the subject was too vast to cover in one evening, but the main points had been canvassed.

Out of the Past.

SUNSTROKE.

[From "Sunstroke", by James Jamieson, published by the Australian Health Society, Melbourne, *circa* 1880, in a pamphlet entitled "Summer Diseases".]

DEATHS from what is called sunstroke are not very common in this country. In the ten years 1869-1878, those registered under that name numbered 201, as many as 45 of them being in the year 1875. The beginning of that year was marked by excessive heat, the reading of the thermometer in the shade at the Melbourne Observatory being the highest recorded in the ten years, rising to 110·4° F. The effects of the heat seem to have been felt most in Melbourne, where 29 out of the 45 fatal cases occurred, the excessiveness of the mortality in the city, in that season, being further shown by the fact that those 29 deaths were nearly half of the ten years' total, viz. 61.

Considerable as the mortality from sunstroke in Melbourne in 1875 may seem, it is small compared with what has been found in some other places .... In spite, therefore, of the great heat often experienced here in summer it may be said that attacks of sunstroke are not very common; and it may be possible to suggest a reason for this from a consideration of the causes ....

.... And here a peculiarity in our climate may be mentioned, to which we probably owe a comparative freedom from fatal cases of sunstroke, viz., that our hottest weather generally is when there is a dry north wind blowing, which favours evaporation from the skin and keeps the body cool in proportion.

Medical Matters in Parliament.

HOUSE OF REPRESENTATIVES.

THE following extracts from *Hansard* relate to the proceedings of the House of Representatives.

October 5, 1960.

Pharmaceutical Benefits.

MR. WHITLAM: I preface my question to the Minister for Health by stating that two months ago he announced that he had accepted the recommendation of the Pharmaceutical Benefits Advisory Committee that 100 drugs should be added to the list of drugs which became available last March to pensioners without charge and to other patients for a charge of 5s. The Minister announced also that these additional drugs would become available on the first day of this month. I now ask the honorable gentleman why these additional drugs are not yet available. Why has there been a delay of seven months in carrying out the committee's recommendations on this occasion whereas three months have sufficed to implement them on some previous occasions?

DR. DONALD CAMERON: It is true that I did announce some time ago that the pharmaceutical benefits list would be extended by the addition of approximately 100 drugs and that these would become available on 1st October. Subsequent to that announcement I had some discussions with the British Medical Association about the forms of prescribing, the quantities to be used and so on. I pointed out then to the profession that if we were to make the alterations which it desired, and which we both agreed were desirable, this would necessitate deferring the implementation of the recommendations for approximately one month. It is now expected that the list will appear in its new form on 1st November.

It is not a fact that this has taken seven months to do. The committee's deliberations took a very long time because it had to examine a very large list of drugs. All concerned in the supply of these drugs—the officials of my department, the committee and the medical profession—agreed that it was preferable to defer the issue on the list rather than to issue it as originally planned on 1st October.

MR. WHITLAM: You told me that the committee last met in March.

MR. SPEAKER: Order! The honorable gentleman has asked his question.

DR. DONALD CAMERON: The committee commenced to meet then, but it has held a number of meetings since.

Social Services Booklet.

MR. IAN ALLAN: I ask the Minister for Social Services whether, in view of the large number of people who at present benefit from the social services and health services provided by this Government and the large amount of money involved, he will confer with the Minister for Health in order to see whether a booklet could be published annually, giving the complete range of benefits available through his Department and the Department of Health and including charts and tables. Will he ascertain whether the cost of providing such a booklet would be justified?

MR. ROBERTSON: I would be willing and most happy to confer with my friend and colleague, the Minister for Health, on any pretext and on any occasion. The honorable member for Gwydir has suggested that we should consider publishing a booklet setting out the benefits available to the community in respect both of social services and of health. From experience, I can say that such a booklet takes some time to prepare and to produce,—so much time in fact that the booklet is soon out of date, so rapidly is the social services scheme changing from year to year. I am sure that my experience in this respect has been shared by the Minister for Health. However, we will be happy to give consideration to what the honorable member for Gwydir has suggested.

October 6, 1960.

Hospital Charges in Adelaide.

MR. GALVIN: I ask the Minister for Health: Is he aware that the Playford Government has made pensioners in South Australia liable to a charge of 60s. a day for hospital treatment at the Royal Adelaide Hospital and that the requirement of two months' membership of a hospital benefit organization before qualifying for payment from the organization and for full government benefit is causing financial hardship to pensioners? Will he consider amending the regulations to provide that pensioners shall become entitled to full government hospital benefit immediately they join a hospital benefit organization?

DR. DONALD CAMERON: I am not aware of the details of any arrangements made in this matter by any State government. Of course, to take the step of abolishing the waiting period within which benefits are not paid would be gravely to imperil the stability of the funds. I do not think that that suggestion can be entertained.

Medical Expenses.

MR. FAIRBAIRN: Does the Acting Prime Minister and Acting Treasurer realize that considerable hardship is suffered by country people who have to travel regularly to capital cities for specialist medical treatment, and who are allowed as a deduction for income tax purposes the medical fee paid but not the cost of travel? Will the Minister get the Treasury to estimate the cost of allowing travelling expenses to be deductible in these special cases, and to ascertain whether such an arrangement could be adequately policed? Will the Minister, after receiving the report from the department, consider granting this concession?

MR. MCEWEN: I shall arrange to have an examination made of the matter raised by the honorable member.

Optometrical Service Benefits.

MR. WHITLAM asked the Minister for Health, upon notice:

1. Does the National Health Act preclude the payment of Commonwealth benefit for a doctor's attendance, in consequence of which spectacles are prescribed?

2. Do State and territorial laws permit optometrists as well as doctors to prescribe spectacles?

3. What proportion of spectacles is prescribed by (*a*) optometrists and (*b*) doctors?

4. Has he approved changes in the rules of some registered medical benefit organizations to provide fund benefits for spectacles prescribed by (*a*) optometrists and (*b*) doctors?

5. When and why did he approve a change in the rules of the Medical Benefits Fund of Australia Limited and the Hospital Benefits Association of Victoria to provide fund benefits for spectacles prescribed by doctors but not by optometrists?

6. What proportion of contributions to registered medical benefits organizations contribute to (*a*) the Medical Benefits Fund of Australia Limited and (*b*) the Hospital Benefits Association of Victoria?

DR. DONALD CAMERON: The answers to the honorable member's questions are as follow:

1. Yes.

2. Yes.

3. No figures are available.

4. Yes.

5. I did not approve any such change. The rules of the Hospital Benefits Association of Victoria do not provide fund benefits for spectacles. The Medical Benefits Fund of Australia Limited has a rule covering the payment of fund benefits for spectacles prescribed by doctors but not by optometrists. This rule has been in existence at least since 1st July, 1953, when the Commonwealth Medical Benefits Scheme commenced.

6. (*a*) 48 per cent. (*b*) 14 per cent.

September 20, 1960.

Uniform Poisons Legislation.

MR. WHITLAM asked the Prime Minister, upon notice:

What action have the Premiers taken on his proposals for uniform poisons legislation, as suggested by the National Health and Medical Research Council in May, 1959?

MR. MENZIES: The answer to the honorable member's question is as follows:

In May, 1959, as the honorable member says, the National Health and Medical Research Council passed a resolution requesting that I write to State Premiers urging the adoption of uniform poisons legislation. In point of fact it was necessary to make proposals to only four of the States; Queensland had already adopted the uniform poisons schedules recommended and Victoria was preparing legislation for introduction into Parliament. My latest advice on the position in the other States is that in Tasmania the necessary legislation is being prepared; in New South Wales, South Australia and Western Australia the proposals are still being considered.

September 21, 1960.

Fluoridation of Water.

MR. WRIGHT: I ask the Minister for Health whether there is general agreement amongst the medical profession of Australia with the claim by United States dental scientists that the fluoridation of drinking water in the proportion of 1 to 1,000,000 does reduce the risk of tooth decay in people. Further, can he say whether any Australian organization has been established to advise local authorities of scientific information dealing with this subject? Finally, do the Minister and the Government endorse the principle of fluoridation of water?

DR. DONALD CAMERON: I think I can best answer the honorable member's question by saying that the National Health and Medical Research Council has considered this matter on more than one occasion and has given as its opinion, and as its advice to the Government, that the fluoridation of water is a potent factor in preventing tooth decay. The implementation of this recommendation, of course, is a matter not for the Federal Government but for the State governments which can take such action as they consider to be suitable and necessary. I do not know that the medical profession has expressed an opinion apart from that given by the National Health and Medical Research Council.

Employment of Physically Handicapped Persons.

MR. GALVIN: I ask the Prime Minister whether Cabinet has given any consideration to that part of the Boyer report on Public Service recruitment dealing with the employment of physically handicapped persons in the Commonwealth Public Service. If so, will the right honorable gentleman inform

the House whether it is intended to amend the regulations covering employment in the Commonwealth Public Service so as to allow the physically handicapped to obtain permanent employment in that service?

MR. MENZIES: Later in the course of this session, I expect to be able to lay some material before the House on the question of the Boyer report. I think perhaps it would be better to do it comprehensively at that time than to take one element separately.

Pensioner Medical Benefits.

MR. BANDIDT: My question without notice is addressed to the Minister for Health. When were medical and pharmaceutical benefits for pensioners introduced in Australia, and by what government? What is the value of these benefits to pensioners at present?

DR. DONALD CAMERON: The pensioner medical service and pharmaceutical benefits for pensioners were both inaugurated in 1951 which, as the honorable gentleman will realize, was during the long and beneficial reign of the present Government.

The honorable gentleman has asked me the value to pensioners of those services. It is not easy to assess that in precise terms per pensioner; however, last year the cost to the Government of the pensioner medical service was somewhat over £4,000,000 and the cost of pharmaceutical benefits for pensioners was somewhat over £3,500,000. So the total cost approximates £8,000,000. As I say, it is not easy to assess the value to pensioners in actual terms per pensioner. One could work out a calculation which would give a statistical answer, but it would not be the real answer. The value of these services is obviously greater to some pensioners than it is to other pensioners who make less call on the services. Another factor is that, by agreement between the British Medical Association and the Government, doctors supplying the services under this scheme do so at considerably less than their normal fees. If the pensioner had to pay normal medical fees for attendance his liability would be very much greater than can be calculated under this scheme. This is a welfare measure of very great value and of enormous advantage to pensioners.

Advertising.

MR. BIRD: I ask the Minister for Health whether it is a fact that the Commonwealth Department of Health is drawing up a national advertising code for voluntary adoption to include a wide range of proprietary medicines and appliances. Does the voluntary basis of this code mean that any commercial enterprise which so desires can ignore the code and advertise its product in an extravagant, exaggerated or dishonest manner?

DR. DONALD CAMERON: At the last meeting of the National Health and Medical Research Council a suggestion was made that it would be advantageous to the public if there were some national code of advertising with respect to medical products, including, I think, patent medicines. The department, with an association which, I think, is called the Association of Australian Advertisers, and the Postmaster-General's Department, is exploring the question of whether it is possible and advisable to take action under the *Broadcasting and Television Act* in order to introduce a voluntary code. The matter is being investigated and, as the honorable gentleman will realize, the legislation, if introduced, would not be a matter for the Department of Health, but would be within the province of my colleague, the Postmaster-General. But all that has happened is that these suggestions have been made and investigations are proceeding to see whether something of public benefit can come from the discussions. A report will be submitted to the next meeting of the National Health and Medical Research Council.

September 22, 1960.

Mental Illness.

MR. E. JAMES HARRISON: My question is directed to the Minister for Health. Can the Minister say why the interim report of the Commonwealth Department of Health covering the period to 30th June, 1960, makes no reference to the advances being made in the psychiatric treatment of mental illness in Australia? In the light of the tremendous advances being made by medical science in the treatment and cure of mental illness, will the Minister examine the possibility of now treating this matter as one of national importance, with the object of planning the eradication of mental illness, guided by the experience gained through State and Federal cooperation in the eradication of tuberculosis, and adopting in this instance similar methods for the eradication of mental illness?

DR. DONALD CAMERON: The reason why the report makes no reference to this subject is that the report deals only with the activities of the department itself. Most of the work on mental health is done by either State departments or institutions outside the Commonwealth Department of Health. The honorable gentleman asks whether some plan could be elaborated similar to the tuberculosis arrangements. I think the answer is that the complete eradication of mental disease is not really a proposition; but my department is giving attention to questions of mental health, and whatever can be done I am sure will be done in the future.

September 27, 1960.

Optometrical Service Benefits.

MR. REYNOLDS: My question is directed to the Minister for Health. Is it a fact that medical benefits funds make benefits available for optical services in cases where the patient is referred to an ophthalmologist by a general medical practitioner, but that the same benefits are not available when the patient is referred by an optometrist? Will the Minister concede that optometrists, by virtue of their specialized training at diploma or graduate status, are likely to be at least as competent to refer patients as are general practitioners? Will he consider removing this discrimination, which affects not only the optometrist, but also the 70 per cent. of people needing optical treatment who consult optometrists rather than general practitioners of medicine?

DR. DONALD CAMERON: The practice of benefit organizations varies in this regard. Some make benefits payable only in the case of spectacles prescribed by medical practitioners, some make them available when spectacles are provided by optometrists. In neither case is any Commonwealth benefit payable, and the circumstances in which fund benefits are payable are a matter for determination by the funds themselves.

Leprosy.

MR. NELSON: I ask the Minister for Health whether he has seen reports expressing the concern of residents in the Northern Territory at the high incidence of leprosy there? Will the Minister comment on these reports, stating what his department is doing about the control and eradication of the disease? Will he give an undertaking that special efforts will be made to stamp out this disease, which responds to treatment if detected in its early stages? Will he also comment on criticism as to the suitability of the site and facilities of the present leprosarium at Darwin, particularly in respect of the segregation from the rest of the community of patients undergoing treatment?

DR. DONALD CAMERON: The position in regard to leprosy in the Northern Territory is, I think, very well understood by the medical personnel in charge of medical services there. I have visited the leprosarium myself on quite a number of occasions, and I am satisfied that it is well sited and well controlled. Leprosy is not a highly infectious disease, but as a result of constant vigilance, several cases have been discovered lately. The honourable gentleman may rest assured that every possible effort is being made not only to treat those cases that are discovered, but also to prevent the spread of the disease. The inhabitants of the Territory have absolutely no cause for alarm.

Alcoholism.

MR. WARD asked the Minister representing the Minister for Repatriation, upon notice:

1. Did the Federal Minister for Health in speaking recently at the opening of the first Australian Conference on Alcoholism, held at the University of New South Wales in Sydney, state that alcoholism is a disease?

2. Have some ex-servicemen, who come from families with a long record of sobriety, and who prior to enlistment were either total abstainers or moderate drinkers, later become alcoholics?

3. Has alcoholism ever been considered for acceptance as a war caused disability; if so, what were the findings and are the records of investigations available for examination?

4. Regardless of whether earlier inquiries have been made into this subject matter, and, taking into account the wide expansion of knowledge which has occurred arising from research into the causes of alcoholism, will the Minister arrange to have urgent consideration given to the listing of alcoholism as a disease which could have arisen from war service?

DR. DONALD CAMERON: I have been advised by the Minister for Repatriation that the answers to the honorable member's questions are as follow:

1. I understand my colleague expressed recently some views on the subject of alcoholism.

2. Yes.

3. Yes, and many cases have been accepted. Each case is dealt with on its merits and in accordance with the provisions of the *Repatriation Act*. The information contained in an ex-serviceman's records is confidential as between him and the department.

In the light of more recent world wide psychiatric research it is now considered that alcoholism is a symptom of an underlying psychiatric disorder rather than a disease in itself. The relationship to war service of any such psychiatric disorder is always considered by the determining authorities.

September 28, 1960.

Pharmaceutical Benefits.

MR. BUCHANAN: Will the Minister for Health consider having the new range of pharmaceutical benefits, and particularly the regulations governing them which, it is announced, will be introduced on 1st November, circulated among chemists for at least one month before they come into operation, so that the chemists may have some opportunity to familiarize themselves with the many changes that are now forecast?

DR. DONALD CAMERON: This matter is already receiving the attention of the Department of Health and I hope to be able to tell the honorable member more about it later.

September 29, 1960.

Drugs.

MR. CURTIN: My question without notice is directed to the Minister for Health. Is it a fact that cheap rubbish in the way of drugs and preparations such as seidlitz powders, chlorbutol, olive oil and cod liver oil are available under the pharmaceutical benefits scheme at 8 oz. for 5s., when they can be purchased without prescription for 3s. 2d.? Is it a fact that tranquillizer drugs such as largactil, karmazine, atarax, equanil, vallergan, siquil, prozin, sparin and stelezine, which are urgently needed by hundreds of thousands of people who suffer from nervous disorders due to the hustle and bustle of modern life, are not on the list? Can the Minister tell me why? My authority for this question—

MR. SPEAKER: Order! I think that the honorable member is giving a great deal of information. I suggest that he ask his question now. He has done pretty well so far.

MR. CURTIN: What I should like to know from the Minister for the benefit of my constituents, is why people cannot obtain these necessary drugs as pharmaceutical benefits when they are suffering from nervous disorders. My information in regard to this—

MR. SPEAKER: Order! The honorable member has asked his question.

MR. CURTIN: You are quite unfair.

MR. SPEAKER: Order! The honorable gentleman will withdraw that remark. He must not reflect on the Chair.

MR. CURTIN: I withdraw it.

DR. DONALD CAMERON: As I have no doubt the honorable gentleman is aware, the admission of drugs to the list of benefits is decided by an expert committee. If the honorable gentleman considers that seidlitz powders are cheap rubbish I can only suggest that he give them a try.

SENATE.

THE following extracts from *Hansard* relate to the proceedings of the Senate.

September 21, 1960.

Employment of Physically Handicapped Persons.

SENATOR GORTON: On 23rd August, Senator Tangney asked me the following questions without notice:

1. As a result of the recent intensive drive to obtain employment for physically handicapped persons, for how many such persons were positions found in each of the States?

2. How many physically handicapped persons are registered for employment in each State?

3. While these persons are waiting for employment are the facilities of the rehabilitation centres available to them?

In answering the questions I undertook to obtain from the Minister for Labour and National Service the information sought by the honourable senator. The Minister for Labour and National Service has now supplied the following answers:

1. The special drive concerned with the physically handicapped referred to by the honourable senator was sponsored by the Australian Junior Chambers of Commerce in close association with the Department of Labour and National Service and Social Services. This drive was held during the first week in May, 1960, with the objective of encouraging employers to employ more handicapped people. It is not possible to distinguish between the placements of handicapped people resulting from the drive from those made as the result of the normal activities of the Commonwealth Employment Service. However, during the quarter ended 30th June, during which period the drive was held, the placements made by the Commonwealth Employment Service of those registered by it as physically handicapped, i.e., persons whose disabilities substantially prejudiced their getting employment, were as follows: New South Wales, 907; Victoria, 606; Queensland, 664; South Australia, 123; Western Australia, 219; and Tasmania, 37. The total of 2,556 represented a 25 per cent. increase compared with the similar period in 1959.

2. The numbers of such physically handicapped persons registered with the Commonwealth Employment Service as at 30th June last, being the date for which the latest figures are available, were: New South Wales, 1,549; Victoria, 1,049; Queensland, 1,055; South Australia, 307; Western Australia, 770; and Tasmania, 101. The total of 4,831 was 1,039 lower than the number registered twelve months earlier.

3. Close liaison maintained between officers of the Commonwealth Employment Service and the Department of Social Services to ensure that all physically handicapped people registered for employment are considered for, and as appropriate, are given the opportunity to avail themselves of, the rehabilitation and training benefits provided under the Social Services Act.

September 22, 1960.

Optometrical Service Benefits.

SENATOR BENN asked the Minister representing the Minister for Health, upon notice:

1. In what States of the Commonwealth are examinations compulsory for persons who desire to enter the profession of optometry?

2. Has the Commonwealth Department of Health studied the examination conditions; if so, is it satisfied that persons who pass such examinations are qualified to practise as optometrists?

3. Is it a fact that contributors to medical benefit societies who require spectacles or any form of eye attention must pay for the services of a general medical practitioner, an ophthalmic surgeon and either an optical goods manufacturer or an optical mechanic before they are eligible for any benefits from the societies; if so, does this unnecessarily circuitous procedure result in some members of the medical profession receiving sums of money for which no service is rendered?

4. How many applications were made during the last financial year to medical benefit societies for benefit payments arising from service received from eye specialists; what was the total benefit claimed and what was the amount actually paid?

5. Why are members of medical benefit societies, who receive attention and spectacles from optometrists legally qualified to provide such service and aids, not entitled to any benefit payments from the medical benefit societies?

SENATOR HENTY: The Minister for Health has now furnished the following replies:

1. Each of the Australian States requires that, subject only to certain minor exceptions, all persons who desire to practise as optometrists shall have a proficiency in that profession, the proficiency being determined by examination in accordance with the standards laid down in the relevant State act.

2. No.

3. No.

4. This information is not available.

5. Although services rendered by optometrists cannot be regarded as medical services, some medical benefit funds do in fact pay benefits for such services.

Correspondence.

TYPISTS' ERRORS AND DOCTORS' HANDWRITING.

SIR: I have collected some typists' errors, due in most cases to doctors' illegible handwriting. Inexperienced typists have produced the following:

He has a blockade in his bowels.
Tonsils have a fowl smell.
He has a varicose udder on his leg.
To apply genital violet to the dermatitis.
He has a dislocated hub (hip).
He died of acute attention.
Neck: clerical disc lesion.
He has a decorated septum.

A more serious consideration is that of doctors' illegible prescriptions, when some chemists have told me that they are forced to guess an ingredient or a dosage. Surely a prescription should be written slowly and carefully, and I suggest that typing should be a compulsory subject for matriculation.

Yours, etc.,

428 Cornwall Street, Greenslopes, Queensland.
October 22, 1960.

J. S. BARR-DAVID.

GENERAL PHARMACEUTICAL BENEFITS.

SIR: Dr. C. H. Selby, in your issue of October 8, criticizes the general tone of my letter on general pharmaceutical benefits. He appears to argue that we should in no circumstances threaten non-cooperation in carrying out Government-sponsored "excursions into nationalized medicine". With this viewpoint I emphatically disagree—in fact, I tremble to consider the future of medical practice in this country if doctors have come to accept as inevitable whatever unilateral action governments choose to take in such matters now and in the future.

I feel that Dr. Selby has missed the chief point of my plea for action by the profession in this matter, viz., that no government has a right to presuppose compliance by the profession in assisting the implementation of schemes which can only be carried out with the active help of the private practitioner. If, on the other hand, the government proposes to provide the people with assistance by some mechanism which does not involve the profession directly in its implementation, then we can have no complaint.

The general practitioner in this country is fortunate in that he is not at present a public servant, and in matters such as pharmaceutical benefits he is merely an agent of the government conforming to certain rules in the matter of prescription writing—without which the patient would not obtain a benefit. Moreover, he is an unpaid agent, unlike the chemist, who receives due compensation for his part in the scheme. The profession, as an agent in such transactions, has a right to be consulted in advance, and a necessary preliminary to the announcement and inauguration of such government benefit scheme should be the agreement by the profession, without duress, to carry out its part in the transaction. No such prior consultation nor agreement in advance was sought or obtained by the Federal Government in its alteration of the pharmaceutical benefits service. In fact, from the beginning Federal Council informed the Government that it was opposed to the alterations, and appealed to the Minister to delay implementation so that all aspects could be fully considered and perhaps a better scheme evolved. This achieved precisely nothing. Is this the "effective liaison with the Federal Government" that Dr. Selby considers will "persuade the Government that our views are the right ones, not for ourselves alone, but for the people as a whole"? The answer is, no, such liaison is not possible with a government which refuses to concede the right of a voluntary agent to prior consultation and agreement. This is not the sort of treatment which the profession received from the same Government some ten years ago when Sir Earle Page was Minister of Health.

It is precisely because we have been forced into unwilling cooperation in a scheme which is in many respects a political confidence trick rather than a genuine national health measure that I have advocated non-cooperation, after due notice, and suggested the sort of pharmaceutical benefits scheme we should be prepared to implement. The Government has the alternative, which I have also pointed out, of providing similar benefits to the community by means of a scheme which leaves the medical practitioner free to prescribe as he chooses, and which is implemented by regulations involving the chemist only. It is really only a question of a different system of costing, on a unit basis rather than on a maximum allowable quantity basis.

Here is an opportunity for the profession to say in effect that it will not be restricted as to what it chooses to prescribe, or in what quantities or for what diseases, and that the provision of a general pharmaceutical service to the community is something to be arranged between government and pharmacist, but is no direct concern of the medical practitioner. I am informed that even in England no such restrictions occur in the matter of prescribing freedom. To me this is a principle worth fighting for.

Yours, etc.,

175 Macquarie Street, Sydney.
October 19, 1960.

E. S. STUCKEY.

HYPOGLYCÆMIC EFFECTS OF CHLORPROPAMIDE.

SIR: I would like to support the warning of Dr. D. S. Pryor (MED. J. AUST., October 1, 1960), regarding the hypoglycæmic effects of chlorpropamide. The following case resembles his experience.

Mr. A. was admitted to a country district hospital on July 27, 1960, with a history of having had "a stroke" two hours previously. He was stated to be an alcoholic, and to have suffered a head injury nine weeks previously, requiring two days' observation in hospital. He had been taking tablets for diabetes for four weeks prior to admission to the district hospital, at the rate of one twice a day.

On examination, he was found to be fully conscious, hungry and very excitable. His deep reflexes were exaggerated. The blood pressure was 110/75 mm. of mercury and urine clear of sugar. He was placed on a light diet and given "Sparine", 25 mg. tablets two three times a day, because of the excitability and history of alcoholism.

Twenty-four hours after admission the patient quite suddenly lapsed into a coma, from which he recovered on administration of 10% dextrose, 250 ml. The patient felt much better the next morning, and was discharged four days later. He was able to show me the tablets he had been taking, and they were found to be chlorpropamide.

The danger of the oral hypoglycæmic agents lies in their administration to people of lower intelligence without regular checks. The ability to handle a syringe and give insulin presupposes a certain amount of intelligence; if this is lacking there is no assurance that the patient will be better on oral treatment.

Yours, etc.,

37 Auburn Street, Moree, N.S.W.
October 25, 1960.

J. F. GALL.

Notes and News.

The Cardiac Society of Australia and New Zealand.

The following are the current office-bearers of the Cardiac Society of Australia and New Zealand: *President*: Dr. C. Fitts. *Chairman-Elect*: Dr. C. Fortune. *Council*: Dr. E. F. Gartrell, Dr. K. Grice, Dr. Ellis Murphy, Dr. J. B. Lowe. *Honorary Secretary and Treasurer*: Dr. J. M. McPhie.

Desiccated Coconut and Intestinal Infection.

According to a statement issued by the South Australian Department of Health, samples from a recent shipment of desiccated coconut from Ceylon were examined in Adelaide. One sample from one brand was found to contain *Shigella flexneri* Type VI. Samples from other brands contained non-pathogenic fæcal coliform organisms in varying numbers.

All of the brand found to contain *Shigella flexneri* was condemned and destroyed under the South Australia *Food and Drugs Act*. As fæcal coliform organisms can be recovered from most raw desiccated coconut, the rest of the shipment landed in Adelaide was released. Since then various types of salmonellæ and fæcal coliform organisms have been recovered in other States from other brands of desiccated coconut from Ceylon. *Salmonella brazzaville*, a rare type in Australia, has been isolated from two patients in Adelaide with gastro-enteritis and also from samples of desiccated coconut in Queensland. Sporadic Flexner dysentery has occurred recently in Adelaide, but no sources of infection have been found. The reported incidence of gastro-enteritis has increased rather than decreased during the recent winter months. Epidemiologically, investigated cases could have been caused by infected food that is eaten only occasionally, but no relationship to desiccated coconut was established.

The report points out that desiccated coconut is a food that may be handled a lot during preparation, and it is apparently a suitable medium for at least the survival of intestinal organisms. If eaten raw, desiccated coconut could be a source of infection in sporadic outbreaks of intestinal disease; if not treated to destroy pathogens, it should be thoroughly cooked by boiling or baking before being eaten.

Fulbright Travel Grants, 1961-1962.

The United States Educational Foundation announces that, under the provisions of the *Fulbright Act*, travel grants are available to Australian citizens to go to the United States for study, research or lecturing at American universities and other institutions of higher learning during 1961-1962.

All candidates must fulfil the following requirements: (*a*) Candidates must hold a university degree or recognized professional qualifications. (*b*) Candidates must possess a guarantee of financial support in dollars for the proposed period of the visit to the United States. (c) Candidates must be affiliated with an approved American institution of higher learning. (*d*) The minimum period of study in the United States for students is one academic year. Lecturers must spend a minimum of one semester and research scholars three months in the United States (exclusive of travel time), of which about two-thirds should be spent at one university or recognized research institution. Grants cannot be given for attendance at conferences alone. All candidates are to return to reside permanently in Australia. (*e*) Candidates must be Australian citizens.

These travel grants are available for travel to the United States for or during the American academic year 1961-1962. All travel grants cover the cost of direct travel between the candidate's home in Australia and the institution he wishes to attend in the United States. No allowances are made for dependants' travel. All awards are made in open competition.

Applications are accepted in the following categories:

(*a*) Visiting lecturers and research scholars, senior category: for scholars who have achieved some professional standing at the post-doctoral level. The closing date for the receipt of applications is January 31, 1961. (*b*) Visiting lecturers and research scholars, junior category: for scholars aged under 30 years who have recently received a Ph.D., or anticipate completing the requirements of a Ph.D. prior to departing for the United States. The closing date for the receipt of applications is January 31, 1961. (c) Post-graduate students: for graduates planning a regular course of study at a pre-doctoral level at an approved American university. The closing date for the receipt of applications is February 28, 1961. (*d*) Special categories awards: for persons whose professions do not require highly specialized academic qualifications. These are open to visiting lecturers, research scholars and students. The closing date is March 31, 1961. No applications can be accepted after the closing dates.

Further information and application forms may be obtained from the United States Educational Foundation, Box 89, G.P.O., Canberra, A.C.T.

Medicine Glasses.

The Standards Association of Australia announces the issue for public comment and criticism of a draft standard for medicine glasses, graduated in either metric or imperial units. Provision is also made for the marking of teaspoon and tablespoon graduations if desired. The purpose of the

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED OCTOBER 1, 1960.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	..	3(3)	3	..	1(1)	..	..	..	7
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	1	..	3	..	..	..	4	..	8
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	1(1)	..	..	..	1
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	..	..	..	..	..
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	6(4)	19(17)	1	..	..	..	8	1	35
Diphtheria	..	..	..	..	..	..	..	..	..
Dysentery (Bacillary)	..	1(1)	..	2(2)	..	..	1	..	4
Encephalitis	..	..	..	1(1)	..	..	..	..	1
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	1(1)	..	..	..	..	..	..	1
Infective Hepatitis	140(61)	106(49)	14(4)	47(31)	4(3)	1(1)	..	..	312
Lead Poisoning	..	..	2	..	..	..	..	..	2
Leprosy	..	..	..	..	1	..	2	..	3
Leptospirosis	..	..	4	..	..	..	..	..	4
Malaria	..	..	1(1)	..	..	..	1	..	2
Meningococcal Infection	..	..	..	..	..	..	..	..	..
Ophthalmia	..	..	..	..	..	..	..	..	..
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	..	3(2)	..	..	..	1(1)	..	..	4
Puerperal Fever	..	..	1	..	..	..	..	..	1
Rubella	..	20(16)	..	1(1)	5(4)	..	..	..	26
Salmonella Infection	..	..	..	2(2)	..	..	..	..	2
Scarlet Fever	9(5)	18(9)	4(3)	5(3)	1	..	..	..	37
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	..	..	..	..	..	..	..
Trachoma	..	..	..	..	2	..	1	..	3
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	18(6)	23(17)	9(4)	5(4)	14(4)	1	..	..	70
Typhoid Fever	..	..	..	..	..	..	..	..	..
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	..	..	..	..	..
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

proposed standard is to exclude measures which are grossly inaccurate, and could thereby constitute a danger, particularly when used for the measurement of potent medicines for children. Copies of the draft (Doc. 515) may be obtained from the headquarters of the Association, Science House, 157 Gloucester Street, Sydney, and from branch offices in capital cities and Newcastle, N.S.W. Comments on the requirements of the draft are now invited, and should reach the Association not later than December 31, 1960.

Naval, Military and Air Force.

APPOINTMENTS.

THE following appointments, changes, etc., are published in the *Commonwealth of Australia Gazette*, No. 68, of October 13, 1960.

ROYAL AUSTRALIAN AIR FORCE.

Permanent Air Force.

Medical Branch.

Robert Duncan Barnaby Leicester (0310791) is appointed to a short-service commission on probation for a period of twelve months, 27th June, 1960, with the rank of Flight Lieutenant.

James Edward Tobler (0220752) is appointed to a temporary commission, 5th April, 1960, with the rank of Pilot Officer (Student).

The probationary appointment of Flight Lieutenant C. F. Campbell (018297) is confirmed.

The resignation of Flight Lieutenant P. A. Mead (0310771) is accepted, 11th August, 1960.

Air Force Reserve.

Medical Branch.

The following former officer is appointed to a commission, 2nd June, 1960, with the rank of Squadron Leader:—W. I. Stuart (0310760).

The following former officer is appointed to a commission, 30th June, 1960, with the rank of Flight Lieutenant:—G. H. Wright (0219617).

Donald Earl Carney (268131) is appointed to a commission, 1st September, 1960, with the rank of Flight Lieutenant.

Flight Lieutenant (temorary Wing Commander) R. O. Willis (253219) is promoted to the temporary rank of Group Captain, 18th August, 1960.

Notice.

MEDICAL JOURNALS WANTED.

THE Australasian Medical Publishing Company Limited has used up its stocks of the following numbers of THE MEDICAL JOURNAL OF AUSTRALIA. Any unwanted copies of these numbers would be gratefully received.

1917: July 21. 1918: September 21, November 30. 1919: January 11, February 22, March 1, May 10. 1920: March 27. 1924: April 19, July 19. 1925: June 27, September 26. 1926: April 3, May 8, July 3. 1929: March 16, August 3. 1930: January 11, February 15, February 22, March 29, April 5. 1933: August 12. 1940: October 12. 1942: January 3, January 10. 1943: January 9. 1946: January 12, February 9. 1949: July 23. 1950: February 18. 1951: May 26. 1952: August 23. 1954: July 24, July 31. 1955: March 12, March 19, March 26. 1958: July 5. 1960: July 16, August 13.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Banáthy, Laszlo Julius Joseph, M.D. (Univ. Debrecen), licensed under Section 21c (3), *Medical Practitioners Act*, 1938-1958, 170 Main Road, Argenton, N.S.W.

Scotton, Roderick Warren, M.B., B.S., 1958 (Univ. Sydney), Royal Hospital for Women, Paddington.

Hardacre, Leslie Brian, M.B., B.S., 1956 (Univ. Sydney), 36 Warragal Road, Turramurra.

Deaths.

THE following death has been announced:

HENRY.—David Colvin Henry, on October 20, 1960, at Randwick, N.S.W.

Diary for the Month.

NOVEMBER 8.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
NOVEMBER 9.—Victorian Branch, B.M.A.: Branch Meeting.
NOVEMBER 10.—New South Wales Branch, B.M.A.: Public Relations Committee.
NOVEMBER 11.—Queensland Branch, B.M.A.: Council Meeting.
NOVEMBER 11.—Tasmanian Branch, B.M.A.: Branch Council.
NOVEMBER 14.—Victorian Branch, B.M.A.: Finance Sub-Committee.
NOVEMBER 15.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

ALL articles submitted for publication in this Journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations, other than those normally used by the Journal, and not to underline either words or phrases.

Authors of papers are asked to state for inclusion in the title their principal qualifications as well as their relevant appointment and/or the unit, hospital or department from which the paper comes.

References to articles and books should be carefully checked. In a reference to an article in a journal the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of article. In a reference to a book the following information should be given: surname of author, initials of author, year of publication, full title of book, publisher, place of publication, page number (where relevant). The abbreviations used for the titles of journals are those of the list known as "World Medical Periodicals" (published by the World Medical Association). If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors submitting illustrations are asked, if possible, to provide the originals (not photographic copies) of line drawings, graphs and diagrams, and prints from the original negatives of photomicrographs. Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary is stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2-3.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this Journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in Australia can become subscribers to the Journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £6 *per annum* within Australia and the British Commonwealth of Nations, and £7 10s. *per annum* within America and foreign countries, payable in advance.